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EFFECTS OF AEROBIC RHYTHMIC EXERCISE AND WEIGHT TRAINING ON SELECTED PHYSIOLOGICAL HAEMATOLOGICAL AND KINANTHROPOMETRIC VARIABLES AMONG COLLEGE MEN OBESE STUDENTS

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IN

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Submitted by

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APRIL - 2021

DEDICATED

TO

Beloved Father : Late. P. THARMAIAH (Rtd. Head Master)

Loveable Mother: T.MARY

My Wife: R.DHIVYA M.Sc., B.Ed.

My Children: B.MELWYN DANISH, B. JOVIN DANISH

My Brother & Sister in Law: T.J.T. BHASKAR & B. JOSELINE

TEACHERS, FRIENDS AND FAMILY MEMBERS

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CHAPTER-I

INTRODUCTION

Performance sports aim at high sports performance and for most physical and psychic capacities of sportsmen are developed to extreme limits. This normally does not happen in other areas of human activities. As a result, the performance sports field possesses valuable knowledge about the limits to which human performance and various performance factors can be developed. It also leads to the discovery of means and methods for improving various physical and psychic capacities (performance factors) to an exceptionally high level. This knowledge can be faithful by applied to other areas of sports and human activities.

The science of sports training is recent to the field of sports science. The sports science discipline has improved at a very fast pace in the past few decades. The knowledge gained by these disciplines has to be understood by the coaches and trainers to apply it correctly to the training process. But a majority of the coaches do not have sufficient scientific background and training to make full and effective use of the knowledge acquired by the sports science disciplines. This creates a gap between scientists and coaches. The science of training with its workers having sufficient background of science and sports can fill this gap and can become a mediator between the scientists and the coaches.

According to Hardayal Singh (1993), Sports Training is a pedagogical process based on scientific principles, aiming at preparing sportsmen for higher performance in sports competitions.

Sports training aims to improve the performance of sportspersons. Weight training and aerobic rhythmic exercises are very popular nowadays and effective training methods to promote higher performance in sprinting and jumping events. Aerobic rhythmic exercises are included depth jumping, hopping, bounding drills, etc are legs plyometric, and medicine balls exercise are arms plyometric exercises. these exercises are used to improve speed, explosive strength, and other motor ability components. Weight training is on activities of high intensity and short duration and opposite side low intensity and high volume or duration. Weight training exercises help to build muscle, strength, and endurance.

1.1 TRAINING

Sports training is the basic form of an athlete's training. It is the preparation systematically organized with the help of exercises, which is a pedagogically organized process of controlling an athlete's development. (Singh, 1984)

Sports Training is the physical, technical, intellectual, psychological, and moral preparation of an athlete through physical exercise. The word training has been a part of human language since ancient times. It denotes the process of preparation for some task. This process invariable extended to some days and even months and years. The term 'training' is widely used in sports to achieve a high level of performance to a particular competition.

Sports training is a systematic process extending over a long period. For best results, the system of training has to be based and conducted on scientific facts and lines. Where it is not possible to do that, the training has to be based on the results

of successful practice which has withstood the test of time. Sports science has still not been able to provide a scientific base for all the aspects and elements of training. Many things are still based on the results of successful practice which on deeper analysis is also a method of science to prove or disprove a theory.

1.2 IMPORTANCE OF SPORTS TRAINING

According to Mathew (1981), Sports Training is the basic form of preparation of sportsmen. The aim of sports training is to prepare a sportsperson physically, physiologically, and psychologically for a possible highest sports performance at the time of main competition, a specific sport. To make a sports person capable of putting up an optional performance, systematic improvement of performance capacity and readiness of sports performance is to be carried out.

Sports training is based on systematic fact and principles. A systematic and suitable for achieving high performance has to be first made based on which sports training is planned. It is always assessed, planned organized, and implemented by a coach or a sports teacher or some other person.

Sports training aims at improving sports performance through physical, physiological, psychological, social intellectual, and moral aspects thus contributing to the development of the all-round personality of the sports person. In other words, the performance of a sportsperson improves as a result of the development of total personality. Therefore, since sports training directly or indirectly focuses attention on the development of the all-round personality of a sports person, sports training is an educational process (pedagogical process).

1.3 AEROBIC RHYTHMIC EXERCISES

Aerobic exercise is sometimes known as "cardio" an exercise that requires the pumping of oxygenated blood by the heart to deliver oxygen to working muscles. Aerobic exercise stimulates the heart rate and breathing rate to increase in a way that can be sustained for the exercise session. In contrast, anaerobic ("without oxygen") exercise is an activity that causes to be quickly out of breath, like sprinting or lifting a heavyweight. Examples of aerobic exercises include cardio machines, spinning, running, swimming, walking, hiking, aerobics classes, dancing, cross country skiing, and kickboxing. There are many other types.

Aerobic exercises can become anaerobic exercises if performed at a level of intensity that is too high.

Aerobic exercise not only improves fitness; it also has known benefits for both physical and emotional health.

Aerobic exercise can help prevent or reduce the chance of developing some cancers, diabetes, depression, cardiovascular disease, and osteoporosis.

Aerobic exercise plan should be simple, practical, and realistic. Specific equipment (such as cardio machines) may be used but is not necessary for successful aerobic exercise.

1.3.1 THE BEGINNING

It all starts with breathing. The average healthy adult inhales and exhales about 7 to 8 liters of air per minute. Once fill the lungs, the oxygen in the air (air

contains approximately 20% oxygen) is filtered through small branches of tubes (called bronchioles) until it reaches the alveoli. The alveoli are microscopic sacs where oxygen diffuses (enters) into the blood. From there, it's a beeline direct to the heart.

1.3.2 THE HEART OF IT

The heart has four chambers that fill with blood and pump blood (two atria and two ventricles) and some very active coronary arteries. Because of all this action, the heart needs a fresh supply of oxygen, and as just learned, the lungs provide it. Once the heart uses what it needs, it pumps the blood, oxygen, and other nutrients out through the large left ventricle and the circulatory system (cardiovascular system) to all the organs, muscles, and tissues that need it.

1.3.3 LOT OF PUMPING IN HEART

The heart beats approximately 60-80 times per minute at rest, 100,000 times a day, more than 30 million times per year, and about 2.5 billion times in a 70-year lifetime! Every beat of r heart sends a volume of blood (called stroke volume -- more about that later), along with oxygen and many other life-sustaining nutrients, circulating through r body. The average healthy adult heart pumps about 5 liters of blood per minute.

1.4 OXYGEN CONSUMPTION AND MUSCLES

All that oxygen being pumped by the blood is important, may be familiar with the term "oxygen consumption." In science, it's labeled VO2, or volume of oxygen consumed. It's the amount of oxygen the muscles extract or consume from

the blood, and it's expressed as ml/kg/minute (milliliters per kilogram of body weight). Muscles are like engines that run on fuel (just like an automobile that runs on fuel); only our muscles use fat and carbohydrates instead of gasoline. Oxygen is a key player because, once inside the muscle, it's used to burn fat and carbohydrate for fuel to keep our engines running. The more efficient our muscles are at consuming oxygen, the more fuel we can burn, the more fit we are, and the longer we can exercise.

The average sedentary adult will reach a level of oxygen consumption close to 35 ml/kg/minute during a maximal treadmill test (where asked to walk as hard as can). Translated, that means the person is consuming 35 milliliters of oxygen for every kilogram of body weight per minute. That'll get through the day, but elite athletes can reach values as high as 90 ml/kg/minute! How do they do it? They may have good genes for one, but they also train hard. And when they do, their bodies adapt. The good news is that the bodies of mere mortals like the rest of us adapt to training too. Here's how.

1.5 REGULARITY OF AEROBIC EXERCISE

The heart gets stronger and pumps more blood with each beat (larger stroke volume). Elite athletes, as I just mentioned, can have stroke volumes more than twice as high as average individuals. But it's not just that. Conditioned hearts also have greater diameter and mass (the heart's a muscle too and gets bigger when train it), and they pump efficiently enough to allow for greater filling time, which is a good thing because it means that more blood fills the chambers of the heart before they pump so that more blood gets pumped with each beat.

Greater stroke volume means the heart doesn't have to pump as fast to meet the demands of exercise. Fewer beats and more stroke volume mean greater efficiency. Think about a pump emptying water out of a flooded basement. The pump works better and lasts longer if it can pump larger volumes of water with each cycle than if it has to pump faster and strain to get rid of the water. High stroke volume is why athletes' hearts don't pump as fast during exercise and why they have such low resting heart rates; sometimes as low as 40 beats per minute, whereas the average is 60-80 beats per minute.

Downstream from the heart are r muscles, which get more efficient at consuming oxygen when do regular aerobic exercise (remember, "consuming" oxygen means that the muscles are taking the oxygen out of the blood). This happens because of an increase in the activity and number of enzymes that transport oxygen out of the bloodstream and into the muscle. Imagine 100 oxygen molecules circulating past a muscle. 're twice as fit if the muscle can consume all 100 molecules than if it can only consume 50. Another way of saying it is that’s twice as fit as someone if r VO2 max is 60ml/kg/min. and theirs is 30ml/kg/min. In terms of performance in this scenario, 'll have more endurance because r muscles won't run out of oxygen as quickly.

Mitochondria inside the muscle increase in number and activity. Mitochondria are the powerhouses of r cells. They do all the heavy-duty work to keep moving. They use the oxygen to burn the fat and carbohydrate that makes go. The good news is that they increase in number and activity, by as much as 50%, in just a matter of days to weeks in response to regular aerobic exercise in adults of all ages.

1.6 BENEFITS OF AEROBIC EXERCISE

There are two physical activity guidelines in the United States. The first, the Surgeon General's Report on Physical Activity and Health, is a lifestyle recommendation. That is, can modify it to fit into r daily routine and activities of daily living. The recommendation is that all adults should accumulate 30 minutes of moderate-intensity activity on most, if not all days of the week. The keywords are "accumulate" and "moderate-intensity." Accumulate means that can do 10-15 minutes at a time and repeat that a couple of times throughout the day; for example, 10 minutes in the morning, 10 minutes at lunch, and 10 minutes around dinner. Moderate intensity is equivalent to feeling "warm and slightly out of breath" when do it. Recently there has been some controversy about the effectiveness of this guideline and its benefits. At the moment the recommendation stands, but we may hear more about it in the not-too-distant future.

The second recommendation is from the American College of Sports Medicine. The ACSM recommends 20-60 minutes of continuous aerobic activity (biking, walking, jogging, dancing, swimming, etc.) three to five times a week, at 60%-90% of maximum heart rate, and two to three days of resistance training. This is a more formal, "workout" recommendation, although can also accumulate the more intense workout in bouts of 10-15 minutes throughout the day if like. Follow this recommendation and r aerobic fitness and r health will improve.

Which one to choose is a personal choice. They are not intended to compete with each other but rather to provide options and maybe even complement each other. For instance, the Surgeon General's recommendation may be more practical

for individuals who are unwilling, or unable, to adopt the more formal ACSM recommendation. Of course, there's no downside to working out regularly with aerobic exercise and also becoming more physically active as per the Surgeon General (take more stairs, mow the lawn by hand, park far away from the store and walk), so combining them might be a good decision.

1.7. WEIGHT TRAINING

Weight training is an effective tool for improving or maintaining strength, endurance, and overall fitness. It involves controlled movements of skeletal muscle to move an external load. This can be accomplished by using machines, free-weights, and exercises involving body weight. Individuals participating in a weight training program can expect improvement in body tone and strength. Incorporating a weight training program as part of a complete fitness plan will contribute to increased weight loss/control, balance and coordination, and a better overall sense of well-being.

1.7.1. WEIGHT TRAINING VERSUS OTHER TYPES OF EXERCISE

Strength training is an inclusive term that describes all exercises devoted to increasing physical strength. Weight training is a type of strength training that uses weights rather than elastic, Eccentric Training, or muscular resistance to increase strength. Endurance training is associated with aerobic exercise while flexibility training is associated with stretching exercises like yoga or Pilates. Weight training is often used as a synonym for strength training but is a specific type within the more inclusive category.

1.7.2. HISTORY OF WEIGHT TRAINING

The genealogy of lifting can be traced back to the beginning of recorded history where man's fascination with physical abilities can be found among numerous ancient writings. Progressive resistance training dates back at least to Ancient Greece when legend has it that wrestler Milo of Croton trained by carrying a newborn calf on his back every day until it was fully grown. Another Greek, the physician Galen, described strength training exercises using the halteres (an early form of dumbbell) in the 2nd century.

Ancient Greek sculptures also depict lifting feats. The weights were generally stones but later gave way to dumbbells. The dumbbell was joined by the barbell in the latter half of the 19th century. Early barbells had hollow globes that could be filled with sand or lead shot, but by the end of the century, these were replaced by the plate-loading barbell commonly used today, (**Todd, 1995**).Another early device was the Indian club, which came from ancient Persia where it was called the "meels". It subsequently became popular during the 19^{th} century and has recently made a comeback in the form of the club-bell.

The 1960s saw the gradual introduction of exercise machines into the still-rare strength training gyms of the time. Weight training became increasingly popular in the 1970s, following the release of the bodybuilding movie Pumping Iron, and the subsequent popularity of Arnold Schwarzenegger. Since the late 1990s increasing numbers of women have taken up weight training, influenced by programs like Body for Life; currently, nearly one in five U.S. women engage in weight training on a regular basis.

1.7.3. BASIC PRINCIPLES

The basic principles of weight training are essentially identical to those of strength training and involve a manipulation of the number of repetitions (reps), sets, tempo, exercise types, and weight moved to cause desired increases in strength, endurance, and size. The specific combinations of reps, sets, exercises, and weights depend on the aims of the individual performing the exercise; sets with fewer reps can be performed with heavier weights.

In addition to the basic principles of strength training, a further consideration added by weight training is the equipment used. Types of equipment include barbells, dumbbells, pulleys, and stacks in the form of weight machines, and the body's weight in the case of chin-ups and push-ups. Different types of weights will give different types of resistance, and often the same absolute weight can have different relative weights depending on the type of equipment used. For example, lifting 10 kilograms using a dumbbell sometimes requires more force than moving 10 kilograms on a weight stack if certain pulley arrangements are used. In other cases, the weight stack may require more force than the equivalent dumbbell weight due to additional torque or resistance in the machine.

Weight training also requires the use of 'good form', performing the movements with the appropriate muscle group, and not transferring the weight to different body parts to move greater weight (called 'cheating'). Failure to use good form during a training set can result in injury or a failure to meet training goals; since the desired muscle group is not challenged sufficiently, the threshold of overload is never reached and the muscle does not gain in strength.

1.8.PHYSIOLOGICAL VARIABLES

Variables are properties or characteristics of some event, object, or person that can take on different values or amounts (as opposed to constants such as *p* which do not vary). Variables related to physiology are said to be physiological variables.

1.8.1 RESTING PULSE RATE

The rhythmic expansion and contraction of the arteries corresponding to each beat of the heart are referred to as the pulse in the medical field. Pulse is the rate at which the human heartbeats, indicating the heartbeat. The pulse can be felt at any spot in the body, wherein the artery is compressed against the bone.

The most prominent spots wherein one can feel the pulse without much difficulty are Physiological spots, where the pulse rate of the heart's rhythmic tone can be ascertained, are Wrists (Radial Artery), Neck (Carotid Artery), Inside of the elbow (Brachial Artery), Behind the neck (Popliteal Artery) and Ankle Joint (Posterior Tibial Artery).

Measuring the pulse can give very important information about individual’s health. Any change from normal heart rate can indicate a medical condition. Fast pulse may signal an infection or dehydration. In emergencies, the pulse rate can help determine if the patient's heart is pumping. The pulse measurement has other uses as well. During exercise or immediately after exercise, the pulse rate can give information about the fitness level and health.

The rhythm and strength of the heartbeat can also be noted, as well as whether the blood vessel feels hard or soft. Changes in the heart rate or rhythm, a weak pulse, or a hard blood vessel may be caused mainly by Cardiac conditions. The automatic nervous system which supplies parasympathetic or vagus nerves and the sympathetic or acceleratory nerves to the Sino-vial artery node plays a prime role in regulating the heart rate. **(Larry, 1982).**

1.8.2 BLOOD PRESSURE

Pressure is exerted by the blood on the walls of arteries.

When the left ventricle ejects blood into the aorta, the aortic pressure rises. The maximal aortic pressure following ejection is termed systolic pressure. As the left ventricle is relaxing and refilling, the pressure in the aorta falls. The lowest pressure in the aorta, which occurs just before the ventricle ejects blood into the aorta, is termed the diastolic pressure.

Mean arterial blood pressure is defined as the average arterial pressure during a single cardiac cycle. As blood is pumped out of the left ventricle into the arteries, pressure is generated. The mean arterial pressure (MAP) is determined by the cardiac output, systematic vascular resistance, and central venous pressure according to the following relationship, which is based upon the relationship between flow, pressure, and resistance. **(Edward and Mathews, 1981).**

Blood Pressure for healthy individual measures: 120/80mmHg. Systolic BP 120+/- 10 and Diastolic BP 80+/-5 are considered normal. A qualitative deviation from the norm is considered to be regarded as abnormal BP. Hypertension increase

in blood pressure above normal for given age and sex. Hypertension enforces heart to work hard as a consequence it hardens Blood vessel. It paves way for a future cardiac problems. Hypotension is an abnormal reduction in Blood Pressure below the lower limit of the normal range.

A graded relationship has been demonstrated between duration and degree of sustained hyperglycemia and the risk of vascular disease. The micro and macrovascular complications of Type 2 Diabetes can be minimized by strict control of Blood pressure with a target of less than 140/80 mmHg **(Nelson, 1986)**.

1.8.3.VO_2 MAX

VO_2 max (also maximal oxygen consumption, maximal oxygen uptake, or aerobic capacity) is the maximum capacity of an individual's body to transport and utilize oxygen during incremental exercise, which reflects the physical fitness of the individual. The name is derived from V - volume per time, O_2 - oxygen, max - maximum.

VO_2 max is expressed either as an absolute rate in liters of oxygen per minute (l/min) or as a relative rate in millilitres of oxygen per kilogram of bodyweight per minute (ml/kg/min), the latter expression is often used to compare the performance of endurance sports athletes

"Maximal oxygen uptake (VO_2max) is widely accepted as the single best measure of cardiovascular fitness and maximal aerobic power. Absolute values of VO_2max are typically 40-60% higher in men than in women."[1] then, VO_2max varies considerably in the population, with sex being a primary determining factor in this variability.

1.9 HAEMATOLOGICAL VARIABLES

The liver is like a big factory that regulates blood sugar is an important chemical compound. The excess blood sugar is stored in the liver as glycogen and released when the blood sugar level lowers. Glycogen molecules are larger molecules containing thousands of glucose molecules. But glycogenolysis individual muscle cells during exercise breakdown glycogen to glucose to provide energy for contraction. Glycogen is also broken down in the liver, with the free glucose being released into the bloodstream and transported to tissues throughout the body **(Power. L and Howley.S, 1996)**.

The exercises produce biochemical changes in the cardiorespiratory system and other important alterations in body composition such as high - density lipoprotein, low - density lipoprotein, blood cholesterol, blood glucose, and triglyceride levels **(Fox and Mathews, 1981)**.

1.9.1 HEMOGLOBIN

Hemoglobin (Hb or Hgb,) is the iron-containing oxygen-transport metallo-protein in the red blood cells of all vertebrates (with the exception of the fish family Channichthyidae) as well as the tissues of some invertebrates. Hemoglobin in the blood carries oxygen from the respiratory organs (lungs or gills) to the rest of the body (i.e. the tissues) where it releases the oxygen to burn nutrients to provide energy to power the functions of the organism in the process called metabolism. In mammals, the protein makes up about 96% of the red blood cells dry content (by weight), and around 35% of the total content (including water). Hemoglobin has an

oxygen-binding capacity of 1.34 mL O_2 per gram of hemoglobin, which increases the total blood oxygen capacity seventy-fold compared to dissolved oxygen in the blood. The mammalian hemoglobin molecule can bind (carry) up to four oxygen molecules.

Hemoglobin is involved in the transport of other gases: It carries some of the body's respiratory carbon dioxide (about 10% of the total) as carbamino hemoglobin, in which CO_2 is bound to the globin protein. The molecule also carries the important regulatory molecule nitric oxide bound to a globin protein thiol group, releasing it at the same time as oxygen.

Hemoglobin is also found outside red blood cells and their progenitor lines. Other cells that contain hemoglobin include the A9 dopaminergic neurons in the substantia nigra, macrophages, alveolar cells, and mesangial cells in the kidney. In these tissues, hemoglobin has a non-oxygen-carrying function as an antioxidant and a regulator of iron metabolism.

Hemoglobin and hemoglobin-like molecules are also found in many invertebrates, fungi, and plants. In these organisms, hemoglobin may carry oxygen, or they may act to transport and regulate other things such as carbon dioxide, nitric oxide, hydrogen sulfide, and sulfide. A variant of the molecule, called leg hemoglobin, is used to scavenge oxygen away from an aerobic system, such as the nitrogen-fixing nodules of leguminous plants before the oxygen can poison the system.

1.9.2. RED BLOOD CORPUSCLES (RBC)

They are circular, biconcave, disc-shaped cells. They do not have a nucleus. But they have a respiratory pigment called hemoglobin. The normal RBC count is 4.5 to 5 million per cu.mm,. RBCs serve important functions such as transport of oxygen and maintenance of acid- base balance. They are synthesized in the bone marrow found at the ends of long and short bones. The average life span of RBC is about 120 days.

- Rouleaux formation is the tendency of RBCs to stick to one another like a pile of coin. This occurs due to the discoid shape of RBCs.
- Polycythemia is a condition where there is an increase in the number of RBCs.
- Anemia is a condition where there is a decrease in the number of RBCs.

1.9.3.HEMOGLOBIN

It is the respiratory pigment of erythrocytes. The red colour of blood is due to hemoglobin. It contains globin, a protein that is conjugated with heme (hemoglobin = heme + globin). Heme molecule contains four pyrrole rings with ion in the centre. The hemoglobin content of the body is about 15G per 100 ml of blood. Anemia occurs due to a decrease in hemoglobin.

The functions of hemoglobin are:

- Transport of oxygen and carbon dioxide
- Maintenance of acid-base equilibrium

- As a source for the formation of bilirubin (Bilirubin is formed from porphyrin fraction of hemoglobin).

- Hemolysis is the escape of hemoglobin from RBC into the blood. This is caused by hypotonic conditions, certain drugs, and toxins.

1.9.4 WHITE BLOOD CELLS (WBC)

They are colorless cells containing a nucleus. They are larger in size than RBCs. Also, their number is less when compared to RBCs (about 8000 per cu.mm of blood).

1.10. KIN ANTHROPOMETRIC VARIABLES

1.10.1.FAT MASS

The body fat percentage (BFP) is of a human or another other living being is the total mass of fat divided by total body mass, multiplied by 100; body fat includes essential body fat and storage body fat. Body fat mass increases with age in both men and women through middle age; a slow decrease occurs after age 70. Even in those people whose body weight does not increase with age, body fat increases as lean body mass decreases. The homeostatic regulation of fat mass becomes faulty with advancing age.

1.10.2. LEAN BODY MASS

Lean body mass (LBM) is a part of body composition that is defined as the difference between total body weight and body fat weight. This means that it counts

the mass of all organs except body fat, including bones, muscles, blood, skin, and everything else. ... Generally, men have a higher proportion of LBM

1.11. OBJECTIVES OF THE STUDY

1. To find out the effect of aerobic rhythmic exercise on selected physiological variables among college men obese students.

2. To find out the effect of aerobic rhythmic exercise on selected Hematological variables among college men obese students.

3 To find out the effect of aerobic rhythmic exercise on selected kin anthropometric variables among college men obese students.

4. To find out the effect of weight training on selected physiological variables among college men obese students.

5. To find out the effect of weight training on selected Hematological variables among college men obese students.

6 To find out the effect of weight training on selected kin anthropometric variables among college men obese students.

7. To find out the effect of aerobic rhythmic exercise, weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students.

1.12. REASONS FOR THE SELECTION OF TOPIC

The researcher has taken interest in the effect of aerobic rhythmic exercise, weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students. Physiological, hematological and kin anthropometric variables were needed to analyze the various changes takes place in their physiological, hematological and kin anthropometric level before and after the training period.

The researcher took this topic because there is a lack of literature and studies in the same fields, and especially on for college men obese students. Hence Researcher wants to find out the effect of each practice separately on college men obese students.

1.13. STATEMENT OF THE PROBLEM

The purpose of the study was to find out the effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students.

1.14. HYPOTHESIS

Based on the conclusion drawn through critical and allied literature related to the study, the investigator has framed the following hypotheses

1. It was hypothesized that there would be significant differences in aerobic rhythmic exercise group than the control group on selected physiological, hematological, and kin anthropometric variables among college men obese students.

2. It was hypothesized that there would be significant differences in the weight training group than the control group on selected physiological, hematological, and kin anthropometric variables among college men obese students.

3. It was hypothesized that there would be significant differences between in aerobic rhythmic exercise group and the weight training group on selected physiological, hematological, and kin anthropometric variables among college men obese students.

1.15. SIGNIFICANCE OF THE STUDY

1. The findings of the study would explore the status of the aerobic rhythmic exercise, weight training among college men obese students

2. The study would bring out the relative effect of aerobic rhythmic exercise, weight training among college men obese students

3. The findings of the study will helpful for further research studies, also helpful for the academy of college men obese students.

4. This study would give an exact idea about physiological variables like resting pulse rate, vo2 max, mean arterial pressure.

5. This study would give an exact idea about Hematological variables like Red Blood Cells (RBC), White Blood Cells (WBC).

6. This study would give an exact idea, about kin anthropometric variables like Fat Mass, Lean Body Mass.

1.16. DELIMITATIONS

The following delimitations were taken into consideration in the interpretation of results:

1. The study was confined to men who have college men, obese students only.
2. The age of the subjects were ranging from 18 to 23years only.
3. The total numbers of subjects were 45college men obese students, in which 15 for the control group, 15 for experimental group I (Aerobic rhythmic exercise), and 15 for Experimental group II (Weight training) and were taken for the study.
4. The subjects were selected from college men obese students from Dr..M.G.R. University, Maduravoyal, Chennai only.
5. The subjects were experimentally treated with aerobic rhythmic exercise, weight training only.
6. The study was conducted on dependent variables such as Vo2 max, Resting Pulse Rate, Mean Arterial Pressure, Hemoglobin count, Red Blood Cells (RBC), White Blood Cells (WBC), Fat Mass, Lean Body Mass only.

1.17. LIMITATIONS

The study was limited in the following aspects.

- The socio-economical status was not taken into consideration.

- No attempt was made to control the factors like air resistance, the intensity of light, atmosphere and temperature.
- Certain factors like lifestyle, body structure, personal habits, and family heredity were not taken into consideration for this study.

1.18 MEANING AND DEFINITION OF THE TERMS

1.18.1 AEROBIC RHYTHMIC EXERCISES

Aerobic exercise is sometimes known as "cardio" an exercise that requires the pumping of oxygenated blood by the heart to deliver oxygen to working muscles. Aerobic exercise stimulates the heart rate and breathing rate to increase in a way that can be sustained for the exercise session. In contrast, anaerobic ("without oxygen") exercise is an activity that causes to be quickly out of breath, like sprinting or lifting a heavyweight.

1.18.2 WEIGHT TRAINING

Weight training is an effective tool for improving or maintaining strength, endurance, and overall fitness. It involves controlled movements of skeletal muscle to move an external load.

1.18.3 RESTING PULSE RATE

The number of pulse beats per unit time, usually per minute. The pulse rate is based on the number of contractions of the ventricles (the lower chambers of the heart). The pulse rate may be too fast (tachycardia) or too slow (bradycardia) (**Karvonen MJ, et.al 1957).**

1.18.4 MEAN ARTERIAL BLOOD PRESSURE:

The average of the systemic systolic and diastolic pressures during a complete cardiac cycle is called the mean arterial pressure. Mean arterial pressure is the diastolic pressure plus one-third of the difference between the systolic and diastolic pressures, i.e pulse pressure. (Fox and Mathews, 1981)

1.18.5. VO2 MAX

VO_2 max (also maximal oxygen consumption, maximal oxygen uptake or aerobic capacity) is the maximum capacity of an individual's body to transport and utilize oxygen during incremental exercise, which reflects the physical fitness of the individual. The name is derived from V - volume per time, O_2 - oxygen, max - maximum.

1.18.6. HEMOGLOBIN

Hemoglobin (Hb or Hgb,) is the iron-containing oxygen-transport metallo-protein in the red blood cells of all vertebrates (except the fish family Channichth-yidae) as well as the tissues of some invertebrates.

1.18.7. RED BLOOD CORPUSCLES (RBC)

They are circular, biconcave, disc-shaped cells. They do not have a nucleus. But they have a respiratory pigment called hemoglobin.

1.18.8. WHITE BLOOD CELLS (WBC)

They are colorless cells containing a nucleus. They are larger in size than RBCs. Also, their number is less when compared to RBCs (about 8000 per cu.mm of blood).

1.18.9. FAT MASS

The body fat percentage (BFP) is of a human or another other living being is the total mass of fat divided by total body mass, multiplied by 100, body fat includes essential body fat and storage body fat.

1.18.10. LEAN BODY MASS

Lean body mass (LBM) is a part of body composition that is defined as the difference between total body weight and body fat weight. This means that it counts the mass of all organs except body fat, including bones, muscles, blood, skin, and everything else. Generally, men have a higher proportion of LBM.

CHAPTER-II

REVIEW OF RELATED LITERATURE

The review of literature is instrumental in the selection of the topic, formation of hypothesis, and deductive reasoning leading to the problem. It helps to get a clear idea and supports the finding with regard to the problem under study.

The review of literature is instrumental in the formation of hypotheses and to get a full picture of what is done with regard to the problem under study. Such a review brings about a deep and clear perspective of the overall field. Now a day the educational program of any type is characterized by reforms and innovative ideas. It seems to be a necessary one to formulate such reviews of various scholars' works. We can bring out a deep insight and clear perspective of the overall field in such reviews. Such collected review have been presented in a logical order, in order to the importance and a sequence of merit. This chapter is a step to get a full picture of what has been done and said about the problem under study. The review of literature is given as follows.

2.1 STUDIES ON AEROBIC

Selda (2020) changing lifestyles reduce the time spent by children on physical activity during the day. The result is an increasing frequency of childhood obesity, which has become one of the most common chronic diseases of childhood. Furthermore, the treatment of obesity in childhood is quite difficult, and the most common problem is non-compliance with obesity treatment. The path that will facilitate the adaptation to treatment comprises nutrition regulation and increased

daily physical activity and psychological support. Diet alone leads to a significant reduction in both fat and non-fat body mass. However, adding exercise to dietary therapy improves weight loss by maintaining non-fat body mass. Even though exercise alone has little effect on weight loss, it provides a significant reduction in mortality. Moreover, regular physical exercise is also an important factor in regulating body composition during growth. However, changes in the child's body during growth affect the motor power and performance, so it is necessary to plan the exercise according to the individual characteristics, age and sex of the child. Short-term frequent exercises are more entertaining and more accessible forms of exercise (dancing at home) for children, and enhance compliance with treatment. Starting treatment as soon as possible will also increase behavioral effectiveness and compliance. This paper focuses on the basics of exercise therapy, which is extremely beneficial for both healthy and obese children.

Felipe et al. (2018) examined the effect of continuous aerobic training (CAT) in hypertensive, obese people. Seven patients of average age (45.3±3.9 years), height (1.63±0.1 m), body weight (89.09±22.0 kg), and body mass index (33.44±8.6 kg/m2) were subjected to the training. CAT was performed in thrice-weekly nonconsecutive sessions (90 min per week) with intervals of 48 hr between each session. The training sessions entailed 30 min of walking at an intensity of 70%–80% of the maximum heart rate (MHR) on a treadmill over a period of eight weeks, giving a total of 24 sessions. Through correlation analyses, we found significant improvement in the systolic pressure (R=0.5675, P=0.0253) and diastolic pressure (R=0.7083, P=0.0088) when the last session was compared to the first session of training. We found no differences in the diastolic pressure and systolic

pressure before, during and after 15 min of the protocol exercise. The program showed a large effect size (ES) for systolic pressure (ES=0.85) and a small ES for diastolic pressure (ES=0.33). We found no differences in the blood pressure (BP) and heart rate (HR) during and after the training of obese hypertensive humans, but we found a positively significant correlation between HR and BP in the last session and a large ES, suggesting that this protocol exercise might have significance effect in the long term.

AbouAssi**, Hiba** Cris A Slentz**,** Catherine R Mikus**,** Charles J Tanner**,** Lori A Bateman**,** Leslie H Willis**,** A Tamlyn Shields**,** Lucy W Piner**,** Lorrie E Penry**,** Erik A Kraus**,** Kim M Huffman**,** Connie W Bales**,** Joseph A Houmard**,** William E Kraus **(2015).** The effects of aerobic, resistance, and combination training on insulin sensitivity and secretion in overweight adults from STRRIDE AT/RT: a randomized trial. *J Appl Physiol.* 15;118(12):1474-82.

Abouassi, et al., (2015) done a study (Studies Targeting Risk Reduction Interventions through Defined Exercise-Aerobic Training and/or Resistance Training) compared the effects of AT, RT, and the combination (AT/RT) on insulin action at both acute and sustained phases. Subjects (N = 196) were 18- 70 yr old (mean age = 50 yr), overweight (mean body mass index = 30 kg/m2), sedentary with moderate dyslipidemia, and were randomized into one of three 8-mo exercise groups: 1) RT: 3 days/wk, 8 exercises, 3 sets/exercise, 8-12 repetitions/set; 2) AT: equivalent to ~19.2 km/wk (12 miles/wk) at 75% peak O2 consumption; 3) AT/RT: the combination of AT and RT. One hundred forty-four subjects completed the intervention. Eighty-eight subjects completed all pre- and post-intervention testing

visits. Insulin sensitivity, glucose effectiveness, and disposition index were measured via a frequently sampled intravenous glucose tolerance test with subsequent minimal model analyses. AT/RT resulted in greater improvements in insulin sensitivity, β-cell function (disposition index), and glucose effectiveness than either AT or RT alone (all $P < 0.05$). Approximately 52% of the improvement in insulin sensitivity by AT/RT was retained 14 days after the last exercise training bout. Neither AT or RT led to acute or chronic improvement in sensitivity index. In summary, only AT/RT (which required twice as much time as either alone) led to significant acute and sustained benefits in insulin sensitivity.

Pintu (2018) studied the effectiveness of six weeks aerobic dance exercises with music on Selected Health Related Fitness Parameters among Adolescent School Girls. A total of 20 adolescent girls student were randomly chosen from the class VIII of a Govt. secondary school of Kolkata. The age of the student was in between 13 to14 years. The body fat percentage (PBF), muscular strength (MS) and muscular endurance (ME) were considered as criterion measure of this study. The instruments and tools used in this study to collect the data was AAHPERD Health Related Physical Fitness Test and skin fold calipers. Aerobic dance exercise programme was scheduled as five days per week basis for a period of six week continuously. The exercise set was repeated 4 times in each day. Duration of the exercise programme was 45 minute per day. Single experimental group design was adopted for this study. The mean and standard deviation were used as descriptive statistics. Difference between post test means and pre test mean were computed by t-test. Only 0.05 level of significance was considered in this study. All calculations were done using Excel 2007 software. Results revealed that the pre-test mean value

for PBF, MS and ME were 25.27, 22.52 Kg and 21.04 t/m respectively. The post-test mean value for PBF, MS and ME were 24.06, 27.61 Kg and 26.43 t/m respectively. The statistical calculations revealed that both the t-value for MS ($t=2.30$) and ME ($t=2.47$) for pre and post test were statistically significant ($p<0.05$). But the computed t-value for PBF ($t=0.33$) between pre and post test was found statistically insignificant ($p>0.05$). On the basis of results the study was concluded that six-week aerobics dance practice has significant effect on muscular strength and muscular endurance but has insignificant effect on body fat percentage among the adolescent school girls.

Rajkumar & Malipatil (2018) studied the effect of aerobic training on selected physical and physiological variables. For the present study 30 male students from Agriculture College, vijayapur. Were selected randomly as the subjects for the study. The age of the subjects ranged between 18 - 21 years the variables selected for the present study were aerobic training (independent variable), muscular endurance, cardio-respiratory endurance, Resting Heart Rate and Vital Capacity. For the study pre test – post test randomized group design; the subjects were further classified at random into two equal groups. Group - I underwent aerobic exercises for five days per week for eight weeks experimental group (15 students) and group - II acted as control group (15 students) was used. The data were collected through the pre test, before training and post test, after eight weeks of aerobic exercises training. For comparing pre and post test means of experimental and control groups of selected physiological variables, descriptive analysis and Analysis of Co-Variance (ANCOVA) were used, the data analyzed with the help of SPSS (16.0 version) software and the level of significance was set at 0.05 level of confidence. The result

of the study showed that there was significant difference between pre and post test (experimental group) of muscular endurance, cardio-respiratory endurance, Resting Heart Rate and Vital Capacity, Another hand there was insignificant difference between pre and post test (control group) of muscular endurance, cardio-respiratory endurance, Resting Heart Rate and Vital Capacity. On the basis of the findings it was concluded that the aerobic training might be responsible for the improvement of selected physical and physiological variables. Like muscular endurance, cardio-respiratory endurance, Resting Heart Rate, Vital Capacity (VC).

Sonia et al. (2018) conducted a study with the objective to test the effect of step aerobics training for six weeks with 6 inches step platform at 118 and 126 beats per minute (BPM) on selected kinematic (Partial Temporal) variables. The study was delimited to female subjects only (N=30), age ranging from 18 to 22 years and the intensity of training set to 118 and 126 beats per minute as protocol 1 and protocol 2 respectively. The study delimited to selected kinematic (Partial Temporal) variables namely as Leg Step up, Leg Step down, Upward Arm Swing, Downward Arm Swing and Ratio Variables. The Data Recording and quantification for pre test and post test were administered by Video Analysis (analysis for partial temporal variables) post test was conducted immediately after step aerobic training for 6 weeks with six inches step platform at 118 BMP as well as 126 BMP independently. Collected data was computed with mean, standard deviation and t-test. The selected variables for the study were Leg Step Up Variable-Right (T1), Leg Step Up Variable-Left (T2), Leg Step Down Variable-Right (T3), Leg Step Down Variable-Left (T4), Upward Arm Swing Variable (T9), Downward Arm Swing Variable (T10), Ratio Variables (T17-T32). It was concluded that there was significant effect

of step aerobics training on the selected kinematic (Partial Temporal) variables in both of the protocols. Effect of step aerobics training for six weeks in different protocol were found to be significant for biomechanical adaptation. All the selected kinematic (temporal) variables supported each other as per the existing literature or research and were found suitable for step aerobic training evaluation.

Sunanth & Sudheer (2018) assessed the effect of Yoga and Aerobic exercises among the cricket players. The subjects for the study were 30 cricket players who had participated in intercollegiate competitions. Three groups were formed, each with 10 players. Group A and Group B was experimental group whereas Group C was control group. The variables selected for the study was Speed, Agility and Leg strength. For the study the Group A and B had to undergo a training of Yoga and Aerobic exercise for a stipulated period respectively. The statistical procedure used for the study was analysis of co-variance and find out the paired mean significant different Scheffe's Post-Hoc Test was used. The test followed by a training showed significant improvement in the selected variables- speed, agility and leg strength for cricket players to come out with flying colours.

Tangarani & Gajanana (2018) lack of physical activity and an uncontrolled diet cause excessive weight gain, which leads to obesity and other metabolic disorders. A sedentary lifestyle poses a threat to individuals' health because it can lead to an increase or progression in the risk of hypertension, obesity, muscle weakness, postural defects, and lean body mass. Measurement, assessment and monitoring of BC in humans have been three of the main challenges for health sciences professionals. Effective weight management strategies consider not only

weight loss toward but also the maintenance of a healthy body weight over time. The researcher was interested in assessing the effects of twelve weeks' aerobic dance training program on body composition of young women. The body composition was assessed using waist to hip ratio and skinfold. The study was a one group pre-test post-test design with thirty subjects. The subjects selected for the study were post-graduate female students studying during 2017-18 at Kuvempu University, Shankaraghatta. Their age ranged between 20 to 25 years. All the subjects were residents of women's hostel within the main campus. The criterion measures of body composition were waist to hip ratio and skinfold measurements at four sites. Descriptive statistics like mean and standard deviation were employed on the raw scores during pre and post-test situations. The differences between mean scores were calculated using 't' test for paired samples. Findings of the study are discussed in detail. Within the limitations of the present study, it is concluded that the exercise intervention in the form of aerobic dance performed for twelve weeks is effective in reducing body fat in young women.

Zaffer et al. (2018) examined the effect of aerobic training on flexibility among endomorph students of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. Data was collected on individually through 30 Control and 30 Experimental group of subjects. The age range between 18±28 years was selected as the subject for the study. The instruction of training was given by researcher every day before starting the training in Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. purposive sampling was used for collection of data. The data were analyzed using descriptive and t test. Only one variable of Physical fitness component was selected as the independent variable i.e. flexibility and sit and reach

test was used for this study. The mean value and standard deviation of control group and experimental group in relation to flexibility of endomorph students was (1.75#4.03pre), (2.01#3.82post) and (2.21#3.53pre), (4.11#3.82post) respectively. Calculated t–ratio of control and experimental group was found 0.257 and 2.054 in relation to flexibility. The results of this study on the basis of statistical analysis states that the significant results were drawn. The experimental group have more efficient flexibility level than of the control group. Further the study reveals that aerobic training has all the essentials to improve flexibility level.

Gary et al. (2017) examined the effects of aerobic and resistance training, and their combination on health-related quality of life (HRQoL) in adolescents with overweight or obesity. After a 4-week run-in period, 304 (91 males, 213 females) post-pubertal adolescents aged 14–18 years, were randomized to 4 groups for 22 weeks of: aerobic training (n = 75), resistance training (n = 78), combined aerobic and resistance training (n = 75), or nonexercising control (n = 76). All participants received dietary counseling with a daily energy deficit of 250 kcal. Indicators of HRQoL such as overall HRQoL, and physical and psychosocial (an aggregate of emotional, social, and school functioning) HRQoL at baseline and 6 months postintervention were measured by the Pediatric Quality of Life questionnaire. The trial began in March 2005 and was completed in June 2011. In the intention-to-treat analyses, all groups showed significant improvements at 6 months on all HRQoL indicators. The aerobic group showed greater improvements than controls on physical HRQoL (mean differences of 5.5; 95% CI; 1.4–9.6, p = 0.009). In participants with ≥70% adherence, combined training produced greater improvements than control on overall HRQoL (mean differences of 4.8, 95% CI;

0.7–9.0, $p = 0.02$), physical HRQoL (mean differences of 5.8; 95% CI: 0.6–10.7; $p = 0.03$), social HRQoL (mean differences of 7.6; 95% CI: 1.0–14.2; $p = 0.02$), and school-based HRQoL (mean differences of 7.6; 95% CI: 1.0–14.2; $p = 0.02$). These findings highlight the potential importance of including resistance exercise into traditional aerobic exercise programs to maximize HRQoL in adolescents with obesity.

Harsh et al. (2017) physical exercise is one of the most effective methods to help prevent cardiovascular (CV) disease and to promote CV health. Aerobic and anaerobic exercises are two types of exercise that differ based on the intensity, interval and types of muscle fibers incorporated. In this article, we aim to further elaborate on these two categories of physical exercise and to help decipher which provides the most effective means of promoting CV health.

Jyoti & Rajkumar (2017) studied the effect of aerobic training on Physical Fitness components of hockey Players. For the purpose of study, 40 subjects were selected from Karnataka. Cardiovascular efficiency was calculated by applying Harvard Step Test. The test was conducted by girl's high school. Recorded for each and every subject. Cardiovascular efficiency was calculated to measure Physical Fitness of subjects. The descriptive Statistical mean was calculated to measure the cardiovascular efficiency of hockey Players. The result of the study revealed that there was a significant change in the Cardio-Vascular efficiency of cricket players.

Osman et al. (2017) determined the effects of 12 weeks aerobic exercise and weight-lifting plus aerobic exercise on blood pressure, blood serum lipids and lipoproteins of sedentary females. Thirty seven sedentary females (Aerobic group

mean age: 44.66 years, Weight-Lifting + Aerobic group mean age: 40.80 years) participated in this study. Before initiate the exercise their blood samples, peripheral measurements and thickness of skinfolds were taken. The subjects participated in aerobics group (n = 21) and weight-lifting plus aerobics group (n = 16) 3 times in a week through one hour. The intensity of exercise was increased gradually and their heart rates were raised up to 130-140 rates per-minute and of the tension. Two way ANOVA was used in this study. There were no significant difference between two different type of exercise groups ($p>0.05$) first group (aerobic); HDL-C (High Density Lipoprotein-Cholesterol) 18.12%, second group (weight-lifting plus aerobic) %28.23, there were a significant increase among them ($p<0.01$). Total cholesterol decrease 13.97% in group of aerobic exercise and it decreases 7.13% in group of weight-lifting plus aerobic. Triglyceride decreases 31.74% in group of aerobic exercise; it decreases 19.53% in group of weight-lifting plus aerobic exercise. Level of LDL-C was decreased 28.11% in group of aerobic exercise, 21.46% in group of weight-lifting plus aerobic. When we consider exercise types, the only flats of type is on triglyceride and APO B, ($p<0.05$), there were effects of exercise duration is on HDL-C, LDL-C AND Total cholesterol ($p<0.01$). There were effects of type and duration of exercise on TC, TG, HDL-C, LDL-C, APO A1, and APO B ($P<0.01$). In this study, regular aerobic and weight-lifting plus aerobic exercises have been shown to reduce the risk of cardiovascular disease in sedentary women and a significant improvement in systolic and diastolic blood pressures as well as reduction of cholesterol, triglyceride, and of LDL-C. Level of HDL-C was increased in both of exercise groups.

Rajkumar & Savitri (2017) examined the effect of aerobic exercise training on haematological variables among college women's. For the present study 30 college women's from Sri B.M. Patil PU College Bijapur. were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of fifteen each and named as Group 'A' and Group 'B'. Group 'A' underwent aerobic exercise training and Group 'B' underwent no training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of aerobic exercise training programme. The level of significance was set at 0.05. The findings of the present study have strongly indicates that aerobic exercise training of eight weeks has significant effect on selected haematological variables i.e., RBC and WBC of college women's. Hence the hypothesis earlier set that aerobic exercise training programme would have been significant effect on selected aerobic exercise training variables in light of the same the hypothesis is accepted. Significant effect of aerobic exercise training was found on RBC and WBC.

Siva Sangari (2017) the aerobic and zumba training is a dance fitness training that incorporates some of the basic principles of interval, resistances, plyometric training to maximize caloric output and improve cardiovascular endurance. Now a days aerobic and zumba becoming a popular mode of exercise especially among women due to its dance steps and mind relaxing catchy music background. This study intend to prove twelve weeks of aerobic and zumba training will shows impact on cardiovascular endurance among middle aged women which

was held in step up fitness center. To achieve the purpose of the study thirty subjects were selected and divided into two equal group namely zumba training (ZT) and aerobic training (AT). Their age ranged between (30-40) and subjects were asked to do training for one hour for five days in a row as for the outcome 12-minutes cooper run and walk test was used to measure cardiovascular endurance. ANCOVA was used to find out the significant differences between the groups. The 0.05 level of confidence was fixed as the level of significance, which was considered as an appropriate. The result of the study revealed that there was a significant difference in cardiorespiratory endurance in zumba and aerobic training group.

Subradeepan (2017) investigated the effect of continuous running on endurance of men kabaddi players. To achieve the purpose of this study, thirty men kabaddi players selected from the Department of Physical Education and Sports Sciences, Annamalai University, Tamilnadu, India. The age, height and weight of the subjects ranged from 19 to 21 years, 155 to 169 centimetres and 58 to 68 kilograms respectively. They were divided into two groups; each group consisted of fifteen subjects. Group-I underwent continuous running and group-II acted as control who does not participate in any training programme. The data collected from the two groups prior to and post experimentation were statistically analyzed by analysis of covariance (ANCOVA). The experimental group had significant improvement on endurance when comparing to the control group.

Yating & Danyan (2017) dyslipidemia is the risk of cardiovascular disease, and their relationship is clear. Lowering serum cholesterol can reduce the risk of coronary heart disease. At present, the main treatment is taking medicine, however,

drug treatment has its limitations. Exercise not only has a positive effect on individuals with dyslipidemia, but can also help improve lipids profile. This review is intending to provide information on the effects of exercise training on both tranditional lipids, for example, low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, triglycerides and new lipids and lipoproteins such as non-high-density lipoprotein cholesterol, and postprandial lipoprotein. The mechanisms of aerobic exercise on lipids and lipoproteins are also briefly described.

Zahoor & Karthikeyan (2017) found out the impact of moderate and high intensity aerobic exercise on selected biomotor performance of college men football players. To achieve purpose of this study, 45 football players were selected from Government Boys Degree College Baramulla, State Jammu and Kashmir, India were selected as subjects at random, the age group of the subjects ranged between 17 to 22 years. The subjects were divided into three equal groups of 15 each. Group-I underwent moderate aerobic intensity training, group-II underwent high aerobic intensity training and group-III acted as control subjects, which didn't participate in any special training apart from their regular activities. The following bio motor variables namely balance and coordination performance was selected as criterion variables. All the subjects of three groups were tested on selected dependent variables at prior to and immediately after the training programme. The ANCOVA (analysis of co variance) was used to analyze the significant difference, if any among the groups. The .05 level of confidence was fixed as the level of significance which was considered as an appropriate. The results of the study revealed that there was a significant improvement on selected biomotor variables such as balance and

coordination for moderate aerobic intensity training group and high aerobic intensity training group as compared to control group among college men football players.

Ozhan Bavl (2016) investigated the effects of eight weeks of step aerobic exercises on static balance, flexibility and selected basketball skills in young basketball players. A total of 20 basketball players (average age 16.1±0.7 years and average sporting age 4.1±0.7 years) voluntarily joined the study. Participants were randomly divided into two groups (experiment n:10 and control n:10). All participants attended basketball training 3 days per week but the experiment group also had step aerobic dance practice 2 days per week. Before and after the study static balance, flexibility and selected basketball techniques were evaluated. SPSS statistical program used for analysis. Repeated measures Anova was used to compare the pre-test and post-test measurements of the groups. The differences between pre-test and post-test measurements in the two groups were examined with the independent t-test. $P< 0.05$ is considered statistically significant in the interpretation of our results. After eight weeks of training, both two groups' static balance and flexibility performances were significantly changed. But only the experiment group had significant improvement in the basketball skill test. The experiment group was also statistically changed in terms of all parameters compared to the control group. According to the results of this study it is possible to say that to improve basketball skills by improving balance and flexibility performance, eight weeks of step aerobic exercise is a useful training model for young basketball players.

Vivek et al. (2016) myocardial Infarction is the leading cause of global mortality. The prevalence rate is 30 million in India. Researchers have found that step aerobic exercise is more effective than other exercises in reducing body fat & blood pressure. This study was designed to examine the effects of moderate intensity step aerobics on heart rate, blood pressure, triglycerides, High density lipoprotein & Low density lipoprotein on a patient with acute Myocardial Infarction. A 55 years old male diagnosed with acute anterior wall Myocardial Infarction was selected for the study based on risk stratification schema two months post discharge from hospital. The exercise session consisted of a 3 phase exercise program 1) a warm-up (10 min of dance aerobics); 2) aerobic exercise training (20 min of step aerobics); 3) a cool-down (10 min of breathing and flexibility exercises) total 40 minutes duration and included three sessions per week. Exercise intensity was controlled by monitoring targeted heart rate. Measurements of Heart rate, Blood pressure were recorded before, at 5 min & 40 min post intervention. Triglycerides, HDL & LDL levels were measured at baseline and at 8th week post intervention. It shows variations in systolic blood pressure and heart rate at baseline and after 8 weeks. No difference in diastolic blood pressure. Significant difference between high density lipoprotein, low density lipoprotein and triglycerides level was observed at the end of 8 weeks. Our findings showed that step aerobics significantly improved heart rate, systolic Blood Pressure and experienced an increase in HDL. This type of currently ‘popularised’ low-cost step aerobic exercise has an important role in the prevention and reducing the morbidity of cardiovascular diseases.

Anek et al. (2015) developed an aerobic step combined with resistance training exercise program, and to compare the effects of A) aerobic step exercise

training (STE), B) resistance aerobic exercise training (RES), C) a combined aerobic step with resistance exercise training (COM) on the health-related fitness, balance, and biochemical bone markers. Sixty participants were working female volunteers at the age of 35-45. They were divided into 4 groups by simple random sampling method. Fifteen of the participants were in the STE group, 14 in the RES group, 15 in the COM group, and 16 in the control group (CON). The STE, RES and COM exercise training programs were designed to yield the same intensity and achieve the same range of heart rate during each stage of the program. During the training, music was used to set the tempo of the workouts. At the 8th week, it was found that resting heart rate and systolic blood pressure significantly-increased only in the STE and COM groups. After 16 weeks, the experiment results showed the significant improvement in the COM and STE groups of exercise training for β-CrossLaps, P1NP NMID Osteocalcin and bone formation (PINP/β-CrossLaps x0.31) but not in the RES group. For balance ability, the COM group showed significantly greater change than the RES group after the training intervention ($p < 0.05$). It can thus be concluded that the STE and COM training were effective in improving bone formation (PINP/β-CrossLaps x 0.31) but not in the RES group. For balance ability, the COM group showed more significant change than the RES group. Therefore, this is not only a good exercise choice for the working-age people but also it can help reduce the risks of osteoporosis and falling in women in particular.

Goldfield et al. (2015) determined the effects of aerobic training, resistance training, and combined training on mood, body image, and self-esteem in adolescents with obesity. Method: After a 4-week prerandomization treatment, 304 post pubertal adolescents (91 males, 213 females) with obesity ages 14–18 years

were randomized to 1 of 4 groups for 22 weeks: aerobic training (n = 75), resistance training (n = 78), combined aerobic and resistance training (n = 75), or non-exercising control (n = 76). All participants received dietary counseling, with a daily energy deficit of 250 kcal. Mood was measured using the Brunel Mood Scale. Body image was assessed using the Multiple Body Self-Relations Questionnaire, and physical self-perceptions and global self-esteem were measured using the Harter Physical Self-Perceptions Questionnaire. Results: Median adherence was 62%, 56%, and 64% in aerobic, resistance, and combined training, respectively. Resistance and combined training produced greater improvements than control on vigor, and resistance training reduced depressive symptoms. All groups improved on body image and physical self-perceptions, but combined showed greater increases than control on perceived physical conditioning, while only resistance training showed greater increases than controls on global self-esteem. Both combined and resistance training demonstrated greater increases in perceived strength than control. Psychological benefits were more related to better adherence and reductions in body fat than changes in strength or fitness. Conclusion: Resistance training, alone or in combination with aerobic training, may provide psychological benefits in adolescents with overweight or obesity, and therefore could be an alternative to aerobic training for some individuals in the biological and psychological management of adolescent obesity.

Jayachandran (2015) examined the effect of yogasana and step aerobic exercises on selected physiological parameters. To achieve these purpose 45 school boys' students were selected from Chidambaram region selected as subjects. Their age group ranged from 14 to16 years. They were divided in to three equal groups of

15 subjects each and assigned to Experimental group-1, Experimental group-2 and control group. The group-1 underwent yogasana+ pranayama exercises and the group-2 utilized step aerobic training. The experimental groups underwent their respective training programme three days per week (alternate days) for twelve weeks. The criterion variables selected are resting pulse rate, vital capacity and breath holding time. ANCOVA was used to find out the significant differences. Statistical analysis found significant differences between yogasana exercises and step aerobics training in improving the physiological parameters. Step aerobics training differed significantly ($p<0.05$) from both yogasana exercises and control groups for resting pulse rate. Both experimental groups improves breath holding time when compare to control group.

Izabela et al. (2013) evaluated the influence of step aerobics training on VOmax, isometric strength and body composition of young female students. Female students aged 19–21 of University of Physical Education and Sport in Gda□sk were subjects in this study. VO2max, isometric strength of elbow flexors and knee extensors, as well as body composition, were measured week before and week after a ten-week step aerobics training. For statistical analysis, basic descriptive statistics and student's t-test were applied for dependent variables. After ten weeks of training there were no statistically significant changes in body composition, probably due to lack of calorie intake control. Significant changes were observed in isometric strength of elbow flexors but no changes in isometric strength of knee extensors. There was a compensation in isometric strength noted between left and right leg after ten weeks of training, where left leg was weaker than the right leg before training. Significant changes were noted in VO2max values, which increased from

42.04 ml/kg/min–1 to 45.71 ml/kg/min–1. Step aerobics training can sufficiently increase VO2max in young females and has a potential in developing strength of upper extremities. When body composition is the main purpose, diet should be taken under consideration.

Joanna et al. (2013) investigation was to look for relationships between the repeatability of forces generated during the movement rhythm present in step aerobics and the movement to a rhythm by the upper and lower limbs alone. As step aerobics requires the symmetric involvement of both the upper and lower limbs, it appears to be important to examine whether a relationship exists between repeatability of a rhythm and a repeatability of forces generated when moving to a rhythm. As step aerobics is considered an endurance activity, the repeatability of the force reproduced by the lower limb muscles may be important in the prevention of injury. The study involved using a mock step bench which consisted of two Kistler force plates. The 29 female subjects of the study executed two motor tasks. The first task was hitting the plate with the dominant and the non-dominant upper and lower limb to a musical rhythm. The second task consisted in performing the basic step of step aerobics on the bench. The rhythm in both tasks was dictated by the beat of a metronome. No statistically significant differences were found between respectability of producing a rhythm by the dominant and non-dominant upper and lower limbs. No correlation was found between the rhythm reproduction error of the limbs and the accuracy of moving to a rhythm during the step aerobics task. This second task was characterized by a high repeatability of the generated forces and a high variability in following a musical rhythm. Body mass does not influence the force generated during rhythm reproduction with the upper and lower limbs. During

step walking, the study participants were characterized with a high repeatability of generated force and also by a high variability in following a musical rhythm.

Pereira et al. (2013) examined the effects of 8 weeks of strength training program alone or combined exercise (step aerobics exercise and strength training) on Body Mass Index (BMI), waist circumference (WC), and maximal strength (1RM) in lower- and upper-body extremities. Thirty-six women were randomized into three groups: strength training (S, N.=13; age: 61.0±9.3 years, BMI: 27.3±4.7 kg/m2), combined step aerobics training and strength training (SE, N.=11; age: 58.3±8.1 years, BMI: 27.8±3.7 kg/m2), or control (C, N.=12; age: 59.0±7.2 years, BMI: 29.5±4.8 kg/m2) groups. Subjects from both experimental groups performed 3 training sessions per week for 45-60 minutes per session. The S was submitted to a high-speed training that consisted of 40% to 75% of 1RM (3 sets 4–12 reps). The SE group combined aerobic exercise using step platform plus strength training. Both training groups significantly improved leg press (S, 80.7% and SE, 42.4%, P<0.001 respectively) and leg extension strength (S, 71% and SE, 35.7%, P=0.000 respectively). However, only the S group showed a significant increase in seated bench press maximal strength (S, +116.7%, SE, +13.6%, P=0.266 and P=0.000 respectively). Over the 8-week training period, the SE group showed significant changes in BMI and in waist circumference (-5.3%, P=0.016 and -3.0%, -2.5 cm, P=0.005, respectively). No significant differences were found in the S or C groups. Decreases in body fat and waist circumference were more evident following combined training. In contrast, higher strength gains particularly for the upper body occurred following 8 weeks of strength training alone compared to combined training.

Rifat et al. (2013) investigated the effects of eight-week step-aerobic exercise programs on flexibility, body weight, body fat percentage and body circumference measurements of sedentary women. 20 sedentary female volunteers participated in the study. Step-aerobic exercises were applied to for every participant for 8 weeks, three days a week and 45 minutes per day. Data were analyzed by using SPSS 17.0 software. For statistical analysis, Paired-t test was used. Significance level was determined to be 0.05. Significant differences were found between mean values of pre-and post-tests (flexibility = 3.35cm; body weight = 4.48 kg; body fat percentage = 3.39%, and the number of heart beats = 4 beats/min) ($p<0.05$). As a result of the step-aerobic exercises, flexibility and all parameters related with the body composition of the individuals were changed positively. The study showed similarity with the results of other studies.

Vallimurugan (2013) examined the effect of aerobic dance training on haematological variables among Ball Badminton players. For the present study 30 female ball badminton players from Selvam Group of Institutions, Namakkal, Tamilnadu were selected at random and their age ranged from 18 to 25 years. For the present study pre test – post test randomized group design which consists of control group and experimental group was used. The subjects were randomly assigned to two equal groups of fifteen each and named as Group 'A' and Group 'B'. Group 'A' underwent aerobic dance training and Group 'B' underwent no training. The data was collected before and after twelve weeks of training. The data was analyzed by applying Analysis of Co-Variance (ANCOVA) technique to find out the effect of aerobic dance training programme. The level of significance was set at 0.05. The findings of the present study have strongly indicates that aerobic dance

training of twelve weeks has significant effect on selected haematological variables i.e., RBC and WBC of ball badminton players. Hence the hypothesis earlier set that aerobic dance training programme would have been significant effect on selected aerobic dance training variables in light of the same the hypothesis is accepted. Significant effect of aerobic dance training was found on RBC and WBC.

Yasmina et al. (2013) investigated the effects of 8-week step aerobic exercises on young women's physiological characteristics, body fat percentage, and quality of life. In so doing, 15 active women with the mean age 26/24 ± 5/86 years, mean weight 61/26 ± 10/85kg, and mean height 160/70 ± 6/25 cm as well as 15 employed women with the mean age 25/94 ± 5/88 years, mean weight 61/60 ± 10/95 kg, and mean height 162/33 ± 6/07 cm voluntarily participated in the study. First, the participants filled out a personal information questionnaire; then, a pretest was conducted, which incorporated tests of Profile Of Mood States (POMS) questionnaire, and tests of height, weight, subcutaneous fat, sit and reach, dyno drag, and strand to measure variables of bewilderment, vitality, fatigue, height, weight, fat percentage, flexibility of back, the strength of back muscles, and maximum oxygen uptake, respectively. Then, the participants of both groups did step aerobic exercise for 8 weeks – 3 sessions of 50 to 60 minutes per week. The same tests were embedded in the post-test. For statistical analysis, descriptive statistics and as for the comparison of the two groups, SPSS was used to perform Mann–Whitney test ($p<0/05$). The results confirmed that step aerobic exercises lead to a significant decrease in fat percentage ($p=0/02$); however, they increase flexibility ($p=0/003$), back muscle strength ($p=0/003$), and maximum oxygen uptake ($p=0/000$), relieve fatigue ($p=0/02$) and bewilderment ($p=0/01$), and finally boost vitality ($p=0/02$) as

well. Generally, doing step aerobic exercises has a dramatic and positive effect on women's physiological characteristics and the quality of their lives. Therefore, it seems necessary to repeat the exercises more and concentrate on the strength of upper body muscles.

Zaletel, et al. (2013) the training effects of contemporary aerobics programmes (hi lo, dance aerobics, step aerobics, aqua aerobics etc.) have been frequently investigated. However, we found no recent paper which reviewed aerobic programmes with regard to their training effectiveness, characteristics of the subjects involved, variables of interest and experimental design. In this paper we summarise the findings of more than 40 studies published in the 2000-2011 period that investigated the training effects of different forms of contemporary aerobics. In this review, the studies are grouped according to their characteristics (sample of subjects, variables of interest, study design, effects, etc.). Around 80% of the investigations dealt with females, with adults being most commonly observed. In the majority of investigations, the authors studied different variables at the same time (morphological anthropometric, motor, cardiovascular, biochemical indices, etc.). In recent studies a trend toward a psychological status examination is evident. In most instances positive training effects on motor-endurance and varsity of physiological variables are declared throughout a training period of 8 to 12 weeks. However, the positive changes in anaerobic endurance are not evidenced. Knowing the tendency of the overall increase of certain psychological disorders in population (including depression) there are indications that future, potentially highly interesting studies will deal with the psychological status of adults and older subjects.

Lundberg, et al. (2012) assessed the influence of an acute aerobic exercise bout on molecular responses to subsequent resistance exercise. Nine physically active men performed 45 min one-legged cycle ergometry exercise, and 4 × 7 maximal concentric-eccentric knee extensions for each leg 6 hrs later. Thus, one limb was subjected to aerobic and resistance exercise (AE+RE), and the contralateral limb to resistance exercise (RE) only. Knee extensor peak power was determined. Biopsies were obtained from m.vastus lateralis before, 15 min and 3 hrs after resistance exercise. Analysis determined glycogen content, mRNA-levels (vascular endothelial growth factor; VEGF, peroxisome proliferator-activated receptor-γ coactivator-1; PGC-1α, muscle RING-finger protein-1; MuRF-1, atrogin-1, myostatin) and phosphorylated proteins (mammalian target of rapamyacin; mTOR, p70S6 kinase; p70S6K, ribosomal protein S6; rpS6, eukaryotic elongation factor 2; eEF2). Peak power was similar in AE+RE and RE. After resistance exercise, the time-course of glycogen utilization and protein signaling was similar across legs. However, phosphorylation of mTOR and p70S6K was elevated in AE+RE vs. RE (main effect $P < 0.05$). VEGF and PGC-1α was higher in AE+RE than RE at PRE and POST1 ($P < 0.05$). Myostatin was lower in AE+RE vs. RE at PRE and POST1 ($P < 0.05$), and downregulated in RE after resistance exercise. Atrogin-1 was higher in AE+RE than RE at PRE and POST1 ($P < 0.05$), and decreased following resistance exercise in AE+RE. MuRF-1 was similar across legs. No difference for any marker was evident at POST2. These results suggest that acute aerobic exercise alters molecular events regulating muscle protein turnover during the early recovery period from subsequent resistance exercise.

Ravinder, et al. (2012) concluded the aerobic training reduce the Total Cholesterol, Triglycerides and LDL cholesterol levels. Different types of exercise programms on the lipid profiles of the individuals might contribute for the enhancement of knowledge in this area, and will be certainly useful to create different protocols of exercise to different individuals basing on the requirements of the individuals. Awareness of Anaerobic training and Aerobic training will help in creating new ideas, and may lead to considerate the knowledge on the effects of exercise on the individuals health related physical fitness. Lack of exercise (Detraining) for one month may increase the Total Cholesterol, Triglycerides and LDL cholesterol levels.

Smol & Fredyk (2012) investigated whether 6-week low-intensity aerobic training program used as a supplement to regular dance practice might improve both the aerobic capacity and psychomotor performance in female ballet dancers. To assess their maximal oxygen uptake (VO2max) and anaerobic threshold (AT), the dancers performed a standard graded bicycle ergometer exercise test until volitional exhaustion prior to and after the supplementary training. At both these occasions, the psychomotor performance (assessed as multiple choice reaction time) and number of correct responses to audio-visual stimuli was assessed at rest and immediately after cessation of maximal intensity exercise. The supplementary low-intensity exercise training increased VO2max and markedly shifted AT toward higher absolute workload. Immediately after completion of the graded exercise to volitional exhaustion, the ballerinas' psychomotor performance remained at the pre-exercise (resting) level. Neither the resting nor the maximal multiple choice reaction time and accuracy of responses were affected by the supplementary aerobic training. The

results of this study indicate that addition of low-intensity aerobic training to regular dance practice increases aerobic capacity of ballerinas with no loss of speed and accuracy of their psychomotor reaction.

Aranga & Kulothungan (2011) studied effect of different intensity aerobic exercise on body composition variables among middle aged men. Sixty male subjects were selected randomly divided four groups and each group consists of fifteen subjects each. The age ranged from 35 to 45. Group 1 underwent as low intensity aerobic exercise, group II underwent moderate intensity aerobic exercise, group III underwent high intensity aerobic exercise and group IV acted as control group. The experimental groups underwent their intensity aerobic exercise programme three days per week for twelve weeks. Control group did not undergo any training programme rather than their routine work. The body composition are percentage body fat and lean body mass were measured by using skin fold caliper. Prior to and after end of practice period all subjects were tested. The results of pre-test and post-test were compared with using Analysis of Co-variance. The results showed that high intensity aerobic exercises were significantly better than low and moderate aerobic exercises in percentage body fat. The moderate and high intensity aerobic exercises significantly influenced lean body mass of middle age men.

Edvardsen, et al. (2011) compared the aerobic capacity during maximal aerobic dance and treadmill running in fit women. Thirteen well-trained female aerobic dance instructors aged 30 ± 8.17 years (mean ± SD) exercised to exhaustion by running on a treadmill for measurement of maximal oxygen uptake ($\dot{V}O_2max$) and peak heart rate (HRpeak). Additionally, all subjects performed aerobic dancing

until exhaustion after a choreographed videotaped routine trying to reach the same HRpeak as during maximal running. The p value for statistical significance between running and aerobic dance was set to ≤0.05. The results (mean ± SD) showed a lower V̇O2max in aerobic dance (52.2 ± 4.02 ml·kg−1·min−1) compared with treadmill running (55.9 ± 5.03 ml·kg−1·min−1) (p = 0.0003). Further, the mean ± SD HRpeak was 182 ± 9.15b·min−1 in aerobic dance and 192 ± 9.62 b·min−1 in treadmill running, giving no difference in oxygen pulse between the 2 exercise forms (p = 0.32). There was no difference in peak ventilation (aerobic dance: 108 ± 10.81 L·min−1 vs. running: 113 ± 11.49 L·min−1). In conclusion, aerobic dance does not seem to be able to use the whole aerobic capacity as in running. For well endurance-trained women, this may result in a lower total workload at maximal intensities. Aerobic dance may therefore not be as suitable as running during maximal intensities in well-trained females.

Nagaraj, et al. (2011) studied effect of stretching exercises and aerobic exercises on flexibility of school boys. For this study sixty school boys were selected at random from Velankanni Matriculation Higher secondary school, Puducherry and their age ranged from 14 -17years. The selected subjects divided in to four groups each group consist of fifteen subjects. Group I underwent stretching exercises, group II underwent aerobics exercises, group III underwent combined exercises (stretching and aerobics exercises) and group IV is control group. The three experimental groups were subjected to the training programme for 10 weeks for three days per week. Control group did not undergo any training programme rather than their routine work. Flexibility was measured by using sit and reach box. Prior to and after end of practice period all subjects were tested. The results of pre-

test and post-test were compared with using Analysis of Covariance. The result shows that combined exercises (stretching and aerobics exercises) were significantly better than stretching exercises, aerobics exercises in flexibility.

Goulopoulou, et al. (2010) examined the effect of aerobic exercise training on vagal and sympathetic influences on the modulations of heart rate and systolic blood pressure in response to an oral glucose load in obese individuals with and without type 2 diabetes mellitus (T2D). Beat to beat arterial pressure and continuous electrocardiogram were measured after a 12-hour overnight fast and in response to glucose ingestion (75 g dextrose) in obese subjects with (T2D group, n = 23) and without (OB group, n = 36) T2D before and after 16 weeks of aerobic exercise training at moderate intensity. Autonomic modulation was assessed using spectral analysis of systolic blood pressure variability (BPV), heart rate variability (HRV), and analysis of baroreflex sensitivity (BRS). Glucose ingestion significantly increased low frequency (LF(SBP)), low frequency HRV (LF(RRI)), and the ratio of low to high frequency components of HRV (LF(RRI)/HF(RRI)), and decreased the high frequency power (HF(RRI)) ($P < .05$). Exercise training increased LF(RRI) and LF(RRI)/HF(RRI) responses, and reduced HF(RRI) and LF(SBP) to glucose ingestion in both groups ($P < .05$), but increased fasted BRS in the OB group only ($P < .05$); glucose intake had no effect on BRS ($P > .05$). In conclusion, a 16-week exercise training program improved cardiac autonomic modulation in response to an oral glucose load in obese adults, independently of diabetes status, and in the absence of remarkable changes in body weight, body composition, fitness level, and glycemic control.

2.2 STUDIES ON WEIGHT TRAINING

Eliane A. Castro., Eliana V. Carraca., Rocio Cupeiro, Bricia Lopez-Plaza (2020). The Effects of the Type of Exercise and Physical Activity on Eating Behavior and Body Composition in Overweight and Obese Subjects. *Nutrients* 2020, 12, 557.

Eliane et al. (2020) examined whether a type of exercise favors better compliance with a prescribed diet, higher eating-related motivation, healthier diet composition or greater changes in body composition in overweight and obese subjects. One hundred and sixty-two (males n = 79), aged 18–50 years, were randomized into four intervention groups during 24 weeks: strength, endurance, combined strength + endurance and guideline-based physical activity; all in combination with a 25–30% caloric restriction diet. A food frequency questionnaire and a "3-day food and drink record" were applied pre- and post-intervention. Diet and exercise-related motivation levels were evaluated with a questionnaire developed for this study. Body composition was assessed by DXA and habitual physical activity was measured by accelerometry. Body weight, body mass index (BMI) and body fat percentage decreased and lean body mass increased after the intervention, without differences by groups. No interactions were observed between intervention groups and time; all showing a decreased in energy intake ($p < 0.001$). Carbohydrate and protein intakes increased, and fat intake decreased from pre- to post-intervention without significant interactions with intervention groups, BMI category or gender ($p < 0.001$). Diet-related motivation showed a tendency to increase from pre- to post-intervention (70.0 ± 0.5 vs 71.0 ± 0.6, $p = 0.053$), without

significant interactions with intervention groups, BMI or gender. Regarding motivation for exercise, gender x time interactions were observed ($F(1,146) = 7.452$, $p = 0.007$): Women increased their motivation after the intervention (pre: 17.6 ± 0.3, post: 18.2 ± 0.3), while men maintained it. These findings suggest that there are no substantial effects of exercise type on energy intake, macronutrient selection or body composition changes. After a six-month weight loss program, individuals did not reduce their motivation related to diet or exercise, especially women. Individuals who initiate a long-term exercise program do not increase their energy intake in a compensatory fashion, if diet advices are included.

Muhammad Nor Faiz Abd Aziz, Norhazira Abd Rahim, Nor Aijratul Mohammad Shalan, Nor Fazila Abd Malek & Ali Md Nadzalan (2020). The Effect Of Weight Training On Muscle Strength, Muscle Endurance And Body Composition Among Overweight Individuals. *International journal of scientific & technology research.* 9, 04.

Muhammad et al. (2020) weight training is one of the training method that often been used to gain muscle strength and size. The aim of this study was to identify the effects of weight training on body mass index (BMI), muscle mass, body fat percentage, hand grip strength and maximal repetition of weight gain in overweight men. This study was conducted using experimental method through pre- and post-test. Body composition analyzer was used to measure BMI, fat percentage and muscle mass. Muscle strength was measured by using the maximum hand grip test while muscle endurance by using the maximum push-up test. The subjects of this study were consisted of 20 individuals (male, BMI 25.76 ± 1.35, age $23.05 \pm$

2.14 years old). Weight training intervention was conducted 3 times per week for 4 weeks. The result shows there was a significant effect of weight training on maximum push-up repetition (p = .000, p<.005). However there were no significant effect of weight training on BMI (p = .586), mass muscle (p = .163), body fat percentage (p = .659) and maximum hand grip (p = .179). In conclusion, the 4-weeks weight training is able to increase the muscle endurance among overweight males. Therefore, it can be suggested that weight training as one of the strategy to improve muscle endurance among overweight males. For future study, it is suggested that the duration of the weight training intervention to be extended to obtain a significant effect.

Helen Collins, Samantha Fawkner, Josephine N. Booth & Audrey Duncan (2018). The effect of resistance training interventions on weight status in youth: a meta-analysis. *Sports Med Open.* 4: 41.

Helen et al. (2018) examined the effect of resistance training on weight status in youth, with participants of school age (5–18 years). There were 24 complete sets of data from 18 controlled trials (CTs) which explored 8 outcomes related to weight status. Significant, small effect sizes were identified for body fat% (Hedges' $g = 0.215$, 95% CI 0.059 to 0.371, $P = 0.007$) and skinfolds (Hedges' $g = 0.274$, 95% CI 0.066 to 0.483, $P = 0.01$). Effect sizes were not significant for: body mass (Hedges' $g = 0.043$, 95% CI -0.103 to 0.189, $P = 0.564$), body mass index (Hedges' $g = 0.024$, 95% CI -0.205 to 0.253, $P = 0.838$), fat-free mass (Hedges' $g = 0.073$, 95% CI -0.169 to 0.316, $P = 0.554$), fat mass (Hedges' $g = 0.180$, 95% CI -0.090 to 0.451, $P = 0.192$), lean mass

(Hedges' $g = 0.089$, 95% CI -0.122 to 0.301, $P = 0.408$) or waist circumference (Hedges' $g = 0.209$, 95% CI -0.075 to 0.494, $P = 0.149$). The results of this meta-analysis suggest that an isolated resistance training intervention may have an effect on weight status in youth. Overall, more quality research should be undertaken to investigate the impact of resistance training in youth as it could have a role to play in the treatment and prevention of obesity.

Paes, Santiago Tavares, Marins, João Carlos Bouzas, & Andreazzi, Ana Eliza. (2015). Metabolic effects of exercise on childhood obesity: a current view. *Revista Paulista de Pediatria*, *33*(1), 122-129.

Paes et al. (2015) reviewed the current literature concerning the effects of physical exercise on several metabolic variables related to childhood obesity. A search was performed in Pubmed/MEDLINE and Web of Science databases. The keywords used were as follows: Obesity, Children Obesity, Childhood Obesity, Exercise and Physical Activity. The online search was based on studies published in English, from April 2010 to December 2013. Search queries returned 88,393 studies based on the aforementioned keywords; 4,561 studies were selected by crossing chosen keywords. After applying inclusion criteria, four studies were selected from 182 eligible titles. Most studies found that aerobic and resistance training improves body composition, lipid profile and metabolic and inflammatory status of obese children and adolescents; however, the magnitude of these effects is associated with the type, intensity and duration of practice. Regardless of the type, physical exercise promotes positive adaptations to childhood obesity, mainly acting to restore cellular

and cardiovascular homeostasis, to improve body composition, and to activate metabolism; therefore, physical exercise acts as a co-factor in fighting obesity.

Magnani et al. (2020) investigated the effects of 2 types of resistance training (RT) models in conjunction with interdisciplinary interventions by other health professionals to reduce the body fat and cardiometabolic risk of obese adolescents while improving their general health-related physical fitness. The 12-week analyses involved 18 male adolescents who were split into 2 groups (weight lifting: n = 9 and functional: n = 9), with equalization according to the primary muscle group (whenever possible), the effort:pause ratio, and intensity. The results showed reductions in fat mass and body fat, as well as in waist and hip circumferences ($p < 0.05$) after the intervention period. However, no significant differences were observed in terms of the body mass, body mass index, neck circumference, systolic and diastolic blood pressures, and for lean mass ($p > 0.05$) after the respective period. Maximal isometric strength, abdominal strength resistance, flexibility, and maximal oxygen consumption all produced significant increases after the interventions ($p < 0.05$). There were reductions in low-density lipoproteins and triglyceride levels after the intervention period ($p < 0.05$). For fasting glycemia, high-density lipoproteins, and alanine aminotransferase, no differences were observed ($p > 0.05$). In addition, no differences were observed in rating of perceived recovery, internal training load, or caloric intake ($p > 0.05$). With the results presented, it is concluded that both RT methods were effective at reducing both fat mass and body fat, thus improving health-related physical fitness components and decreasing cardiometabolic risk.

Ribeiro et al. (2020) phase angle (PhA) is a viable indicator of cellular health, with higher values reflecting better cellularity, cell membrane integrity, and cell function. Adaptive responses to resistance training (RT) on PhA may be important in obese older people. The main purpose of the present study was to investigate the effects of 8 weeks of RT on PhA in obese older women. Thirty-three obese older women (68.1 ± 5.7 years, 71.6 ± 10.1 kg, 154.5 ± 6.7 cm, 30.0 ± 4.1 kg•m −2 , and 45.0 ± 6.0% body fat) were randomly allocated into 1 of 2 groups: a training group that performed the RT program (TG, n = 18) or a nonexercise control group (CG, n = 15). The whole-body RT consisted of an 8-week RT program involving 8 exercises performed for 3 sets of 8–12 repetitions 3 times a week. Anthropometric, body fat and fat-free mass, PhA, total body water (TBW), intracellular water (ICW), and extracellular water compartments were performed at before and after training. After the intervention period, the TG presented greater increases ($p < 0.05$) than CG for fat-free mass (TG = +1.3% and CG = −0.3%), TBW (TG = +2.0% and CG = −1.7%), ICW (TG = +3.1% and CG = −1.9%), and PhA (TG = +3.4% and CG = −1.4%), and lower values for percentage of body fat (TG = −1.3% and CG = +0.9%) and bioimpedance resistance (TG = −4.6% and CG = +2.3%). Our results suggest that 8 weeks of RT improves PhA—a cellular health parameter—in obese older women.

Wilson et al. (2020) investigated the impact of an isocaloric and isonitrogenous ketogenic diet (KD) versus a traditional western diet (WD) on changes in body composition, performance, blood lipids, and hormonal profiles in resistance-trained athletes. Twenty-five college-aged men were divided into a KD or traditional WD from weeks 1 to 10, with a reintroduction of carbohydrates from

weeks 10 to 11, while participating in a resistance training program. Body composition, strength, power, and blood lipid profiles were determined at weeks 0, 10, and 11. A comprehensive metabolic panel and testosterone levels were also measured at weeks 0 and 11. Lean body mass (LBM) increased in both the KD and WD groups (2.4% and 4.4%, $p < 0.01$) at week 10. However, only the KD group showed an increase in LBM between weeks 10 and 11 (4.8%, $p < 0.0001$). Finally, fat mass decreased in both the KD (-2.2 ± 1.2 kg) and WD groups (-1.5 ± 1.6 kg). Strength and power increased to the same extent in the WD and KD conditions from weeks 1 to 11. No changes in any serum lipid measures occurred from weeks 1 to 10; however, a rapid reintroduction of carbohydrate from weeks 10 to 11 raised plasma triglyceride levels in the KD group. Total testosterone increased significantly from weeks 0 to 11 in the KD diet (118 ng•dl -1) as compared to the WD (-36 ng•dl -1) from pre to post while insulin did not change. The KD can be used in combination with resistance training to cause favorable changes in body composition, performance, and hormonal profiles in resistance-trained men.

Batista et al. (2020) examined the independent and combined effects of pubertal and weight status on concurrent measurements of peak oxygen ($\dot{V}O_2$ peak) in school-aged adolescent males. The final sample included 49 boys (12.3 ± 0.8 years). $\dot{V}O_2$ peak was derived from an incremental progressive maximal protocol using a motorized treadmill. In addition, maximal oxygen uptake was estimated from a 20-m shuttle run test. Static allometric models were obtained as an alternative to performance output per unit of size descriptors. Weight status had a significant effect on $\dot{V}O_2$ peak using simple ratio standards per unit of body mass (BM) with adolescents classified as overweight and obese (OWOB) attaining lower

values of V̇ O 2 peak. A similar trend was noted for the allometric models adopting body mass (ml•kg BM −0.542 •min −1), stature (L•m −2.602 •min), and fat-free mass (FFM; ml•kg FFM −0.907 •min −1). Findings also suggest the influence and interaction of pubertal and weight status on absolute values of V̇ O 2 peak. Considering the data obtained, linear equations to estimate V̇ O 2 peak from the 20-m shuttle run test should not be applied to boys who are OWOB because it will produce inaccurate assessments of cardiorespiratory fitness and penalize those who are heavier. Equations for V̇ O 2 peak prediction need to be specific for pubertal status and preferably consider FFM as a body size descriptor.

Nobre et al. (2017) analyzed the effects of a protocol of plyometric training on body composition and motor performance of boys who were overweight/obese aged 7–9 years. The sample was randomly assigned into 2 groups: plyometric training group (T, n = 40) and control group (C, n = 19). Training consisted of 20 min•d −1 (twice a week, during 12 weeks) of lower extremity plyometric exercise. Health-related physical fitness was measured by handgrip strength, standing long jump (SLJ), curl-ups, sit and reach, square test, running speed, and mile run test. Gross motor coordination was evaluated by means of the Körperkoordinations-test für Kinder (KTK) tests. Baseline and postintervention differences were investigated, and effect size was estimated through Cohen's d coefficient. Both groups showed increased body weight, height, and sitting height after intervention with a negligible effect size. Only T group showed increased fat-free mass (p = 0.011) compared with baseline values with small effect size. Plyometric training improved handgrip strength (d = 0.23), sit and reach (d = 0.18), curl-ups (d = 0.39), SLJ (d = 0.80), agility (d = 0.48), and time in the mile run test (d = 0.38). For gross motor

coordination results, T group showed better performance in all tests after plyometric training with moderate/large effect size. Thus, 12 weeks of PT improved health-related physical fitness components and motor coordination acquisition of 7- to 9-year-old boys who were overweight/obese.

Moraes et al. (2013) compared 2 models of resistance training (RT) programs, nonperiodized (NP) training and daily nonlinear periodized (DNLP) training, on strength, power, and flexibility in untrained adolescents. Thirty-eight untrained male adolescents were randomly assigned to 1 of 3 groups: a control group, NP RT program, and DNLP program. The subjects were tested pretraining and after 4, 8, and 12 weeks for 1 repetition maximum (1RM) resistances in the bench press and 45° leg press, sit and reach test, countermovement vertical jump (CMVJ), and standing long jump (SLJ). Both training groups performed the same sequence of exercises 3 times a week for a total of 36 sessions. The NP RT consisted of 3 sets of 10–12RM throughout the training period. The DNLP training consisted of 3 sets using different training intensities for each of the 3 training sessions per week. The total volume of the training programs was not significantly different. Both the NP and DNLP groups exhibited a significant increase in the 1RM for the bench press and 45° leg press posttraining compared with that pretraining, but there were no significant differences between groups ($p \leq 0.05$). The DNLP group's 1RM changes showed greater percentage improvements and effect sizes. Training intensity for the bench press and 45° leg press did not significantly change during the training. In the CMVJ and SLJ tests, NP and DNLP training showed no significant change. The DNLP group showed a significant increase in the sit and reach test after 8 and 12 weeks of training compared with pretraining; this did not

occur with NP training. In summary, in untrained adolescents during a 12-week training period, a DNLP program can be used to elicit similar and possible superior maximal strength and flexibility gains compared with an NP multiset training model.

2.3 SUMMARY OF REVIEW OF RELATED LITERATURE

The investigator has compiled and reviewed all the literature and professional reviews related to effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students from the library of TNPESU and the material available on the internet to provide sufficient knowledge to the readers and comparative analysis of the present study.

The reviews show that there are significant positive effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students. The investigator has found very few studies made on comparative analysis with aerobic rhythmic exercise and weight training. Based on the experience gained the investigator formulated a suitable methodology to be applied in this research that is presented in chapter III.

CHAPTER III

METHODOLOGY

In this chapter selection of subjects, selection of variables, experimental design, reliability of data, training schedule, training program, collection of data and statistical technique have explained.

3.1. SELECTION OF SUBJECTS

For the present investigation BMI Weight Status Categories forty-five (45) college men obese students were selected by BMI Weight Status Categories from Dr..M.G.R University, Maduravoyil, Chennai. Totally Twelve weeks of training was given of Aerobic rhythmic exercise and Weight training to the subjects. The subjects were assigned to two Groups namely experimental group I, experimental group II, and Control group. Each group consists of 15 subjects. Aerobic rhythmic exercise and Weight training were given to Experimental Group I and Experimental Group II respectively, no training was provided to Control group as listed below.

Experimental Group 'I' - (Aerobic rhythmic exercise Training)

Experimental Group 'II' - (Weight Training)

Control Group - No training

3.1.1. Subjects Orientation

The investigator held a meeting with the subjects prior to the administration of tests. The purpose, the significance of this study, and the requirements of the testing procedure were explained to them in detail, so that there was no ambiguity in their minds, regarding the efforts required of them. At the commencement of the training programme, the subjects were assembled and were given a thorough orientation on the requirements and objectives of the research.

3.2. SELECTION OF VARIABLES

The investigator reviewed the available scientific literature pertaining to the study from books, journals, periodicals, magazines, research papers, and available sources Tamilnadu Physical Education and Sports University, M.G.R University, Maduravoyil, Chennai libraries, and also with help of experts.

3.2.1. Selection of the Dependent Variables

Physiological variables

a. Resting Pulse Rate

b. VO_2 Max

c. Mean Arterial Blood Pressure.

Hematological variables

1. Hemoglobin count

2. Red Blood Cells (RBC)

3. White Blood Cells (WBC)

Kin anthropometric Variables

1. Fat mass

2. Lean Body Mass

3.2.2. Selection of the Independent Variables

a. Experimental Group I -Aerobic rhythmic exercise Training

b. Experimental Group II – Weight Training

c. Group 'III' - (Control group, No training was provided).

3.3. PILOT STUDY

The Pilot Study was conducted with five players from each group (college men obese students) and their difficulties were noted and rectified. The calculated intra-class correlation of the pilot there was a significant improvement in health related physiological, hematological, and kin anthropometric variables. This enabled the investigator to adopt a suitable training schedule for the study.

3.4. CRITERION MEASURES

Physiological variables

a. **Resting Pulse Rate** - Citizen Make digital B.P monitor.

b. **VO_2 Max** - was assessed using Cooper's Test.

c. **Mean Arterial Blood Pressure** - P mean = Diastolic pressure + 1/3 pulse Pressure.

Hematological Variables

a. Hemoglobin count - Blood Samples (Standard Laboratory)

b. Red Blood Cells - Blood Samples (Standard Laboratory)

c. White Blood Cells - Blood Samples (Standard Laboratory)

Kin anthropometric Variables

a. **Fat mass -** Omron body fat monitor and weighing machine (Fat mass (kg) = percentage fat X body weight (kg)

b. **Lean Body Mass -** weighing machine and fat mass (Lean Body Mass (kg) = body weight (kg) – Fat Mass (kg)

3.5. RELIABILITY OF DATA

Test and Retest methods was followed in the order to establish the reliability of the data by using 45 subjects. All the variables selected in the present study were tested twice for the subjects by same person under similar conditions then the reliability was established by using intraclass correlation coefficient of test and test scores.

3.5.1. RELIABILITY OF THE TESTS

Tester's competency was evaluated with the reliability of the tests. Reliability of the test was established by test-retest method whereby the consistencies of results were obtained by intra-class correlation. The repeated measurement of individuals on the same test was to determine reliability, as it was univariate not a bivariate situation. It is the distribution of a single variable. It makes sense, then to use a univariate statistic like Intra-class correlation co-efficient.

3.5.2. RELIABILITY OF INSTRUMENT

All the equipment which were used in the study all that equipment had been obtained from slandered firms which cater to need of various research laboratories in India and abroad and their calibrations were accepted as enough for the purpose of the study.

3.5.3. SUBJECT'S RELIABILITY

The Intra-class correlation coefficient of test-retest values also determined that subject reliability was adequate as the same tester used the same subjects under similar conditions. Motivation techniques were not used. In order to get uniform results from the subjects, they were oriented about the study prior to the conduct of the test. The test-retest methods were used to find out the subject's reliability.

3.5.4. INSTRUMENT RELIABILITY

The investigator learnt the procedure and methods to handle and operate the instruments to administer the tests. The services of qualified assistance were used while taking the measurements.

All the equipment which were used in the study had been obtained from standard firms which catered to the need of various research laboratories in India and abroad. All instruments were available in Mukesh Diagnostic Center, Chennai, and their calibrations were accepted as enough for the study.

3.5.5. TESTER'S RELIABILITY

The repeated measurement of individuals on the same test is done to determine reliability, is either a univariate or a bivariate situation. It is the distribution of a single variable like an Intra Class correlation co-efficient Baumgarrter and Jocker (2004). The Intra Class correlation coefficient obtained for test-retest are presented in Table - I

TABLE - I

INTRA CLASS CORRELATION CO-EFFICIENT OF TEST – RETEST

Test	Instruments	r
Resting Pulse Rate	Digital Monitor (citizen equipment)	**0.92***
VO_2 Max	was assessed using Cooper's Test	**0.96***
Mean Arterial Blood Pressure	P mean = Diastolic pressure + 1/3 pulse pressure Digital Monitor (citizen equipment).	**0.97***
Hemoglobin	Blood Samples (Standard Laboratory)	**0.93***
Red Blood Corpuscles	Blood Samples (Standard Laboratory)	**0.95***
White Blood Corpuscles	Blood Samples (Standard Laboratory)	**0.91***
Fat Mass	Omron body fat monitor and weighing machine	**0.97***
Lean Body Mass	weighing machine and fat mass	**0.96***

* Significant at o.o1 level

3.6. EXPERIMENTAL DESIGN

The study was formulated as a truly random group design, consisting of a pre-test and post-test. The forty-five subjects were randomly assigned to three equal groups of fifteen college men obese students each. The groups were assigned as aerobic rhythmic exercises group, weight training group, and control group respectively. The Pre-test was conducted for all the forty-five subjects on selected physiological, hematological, and kin anthropometric variables the college men obese students.

Aerobic rhythmic exercises were given to the Experimental Group - I for five days a week for twelve weeks, Weight training was given to Experimental Group - II for five days in a week for twelve weeks in a week for 45 - 60 minutes, and control group was left on their own.

The Post test was conducted on the dependent variables after twelve weeks of Aerobic rhythmic exercises (Experimental Group - I) Weight training (Experimental Group - II).

TABLE - I

TRAINING PROGRAMME FOR EXPERIMENTAL GROUPS

GROUPS	**PROGRAMMES**
Experimental Group - I	Aerobic rhythmic exercise Training
Experimental Group - II	Weight Training
Control Group	No training

3.6.1. Experimental Group - I (Aerobic rhythmic exercise Training)

Aerobic exercise (also known as cardio) is a physical exercise of low to high intensity that depends primarily on the aerobic energy-generating process. Generally, light-to-moderate intensity activities that are sufficiently supported by aerobic metabolism can be performed for extended periods. Doing aerobics regularly can decisively improve heart rate, body condition, and state of mind. Aerobic exercise gets the heart working to pump blood through the heart more quickly and with more force than normal. As blood is pumped faster, it must be oxygenated more quickly, which quickens respiration. Aerobic exercise strengthens the heart and boosts healthy cholesterol levels. Over 20 years of research has shown that aerobic exercise is one of the best exercises. Aerobics conditions heart and lung, helps to use oxygen more efficiently and helps control weight, and reduces stress. Aerobics helps relax tense muscles, and regular aerobics activity increases the body's production of endorphins (a natural sedative) and catecholamine (chemical substances that help stabilize moods).

The major benefits of aerobic exercises are a stronger and more efficiently operating heart and lungs more energy physical flexibility, conditioned muscles, proper use of fats, and effective burning of calories The increased oxygen flow gained through aerobics re-energizes by giving more energy and a ‘re-awakening ‘of senses.

TABLE – II

AEROBIC RHYTHMIC EXERCISE TRAINING PROGRAMME

(FLOOR)

Weeks	Floor Aerobics	Duration	Intensity	Counts	Sets	Rest Between the sets
1-4	Side to Side	15-20 Mins	40 to 60%	20-24	2	30 – 60 sec
	Grapevine					
	Double Side to Side					
	Cross Over Step					
	Knee Curl					
	Front Kick					
5-8	Touch Out	20-25 Mins	50 to 70%	24-28	3	60- 90 sec
	Side Kick					
	Knee and Arm Lift					
	Jump on the Spot					
	Cross Over Step					
	Knee Curl					
9-12	Grapevine	25-30 Mins	60 to 80%	28-32	4	90 – 120 sec
	Double Side to Side					
	Cross Over Step					
	Jump on the Spot					
	Knee Curl					
	Front Kick					

FLOOR AEROBICS

Floor aerobics is a form of aerobic power distinguished from other types of aerobic exercise performed on the plain floor. The floor must be safe without any protrude and safe in manner. Floor aerobics are done with a count. Floor aerobics was developed in a manner to avoid doing exercise in an open place. Day by day the women took the advantageous that is to be performed.

TABLE – III

AEROBIC RHYTHMIC EXERCISE TRAINING PROGRAMME (STEP)

Weeks	Step Aerobics	Duration	Intensity	Counts	Sets	Rest Between the sets
1-4	Leg Curl Toe Tap L Step Turn Step Slice Back Lunging	15-20 Mins	40 to 60%	20-24	2	30 – 60 sec
5-8	V Step Bench Step Step Touch Straddle Down Slice Back Lunging	20-25 Mins	50 to 70%	24-28	3	60- 90 sec
9-12	A Step Kick Forward Step Touch Knee Up Bouble Step Side Toe Tap	25-30 Mins	60 to 80%	28-32	4	90 – 120 sec

STEP AEROBICS

Step aerobics is a form of aerobic power distinguished from other types of aerobic exercise by its use of an elevated platform (the step). The height can be tailored to individual needs by inserting risers under the step. Step aerobics classes are offered at many gyms and fitness centers that have a group exercise program. Step aerobics was innovated by Gin Miller around 1989. After a knee injury, Gin consulted with an orthopedic doctor, who recommended she strengthen the muscles supporting the knee by stepping up and down on a milk crate and from this, she developed the step regimen.

3.6.2. EXPERIMENTAL GROUP - II (WEIGHT TRAINING)

Weight Training programme differs in the land, a number of repetition, sets, rest interval and is based on the individuals physical fitness. Some individual train for bulk, and others for definitions. Some train for strength and others for speed. In the case of basketball, strength is needed in the form of speed. This is known as power and can be defined as force ties distance or the rate at which work is done. In other words, explosive type movements are desirable in a weight programme for basketball players. Though major muscle groups of the body are involved in college men obese students since the hips and legs are responsible for jumping and running, they get first priority. Muscle groups involved include the quadriceps, hamstrings, gastroncnemius, and those associated with the hips such as gluteus and adductor muscles. The smaller muscles of the upper body which are used are the deltoids, triceps, biceps forearm, and pectoral’s groups.

Weight training for basketball should be as specific to the sports as possible. Each exercise movement should correlate highly with the movements involved in the sports. Since Basketball is a very quick and powerful game, the exercises chosen were powerful. At the same time, the training programme should be well rounded and geared towards total body strengthening. Keeping this in mind the above concepts the following weight training exercise were given to the weight training group.

TABLE - IV

TWELVE WEEKS WEIGHT TRAINING PROGRAMME

WITH TARGET PERCENT 1 RM

Weekly Schedule	Muscle	Duration	Set	Repetition	Target 91 Rep.) % of Maximum
1 to 3	A. Major Muscle Groups Exercises 1, 2, 3, 4, 10	40 – 45 mins	3	2 to 4	60 - 70
	B. Exercises 5, 6, 7, 8, 9		1	6 to 7	30 - 35
4 to 6	A. Major Muscle Groups Exercises 1, 2, 3, 4, 10	45 – 50 mins	4	4 to 6	70 - 75
	B. Exercises 5, 6, 7, 8, 9		2	7 to 8	35 - 40
7 to 9	A. Major Muscle Groups Exercises 1, 2, 3, 4, 10	50 – 55 mins	5	6 to 8	75 - 80
	B. Exercises 5, 6, 7, 8, 9		3	8 to 9	40 - 45
10 to 12	A. Major Muscle Groups Exercises 1, 2, 3, 4, 10	55 – 60 mins	6	8 to 10	80 - 85
	B. Exercises 5, 6, 7, 8, 9		4	10	45 -50

3.7. TEST ADMINISTRATION

The administration of the test and the method of collecting data are explained at this time.

3.7.1.PHYSIOLOGICAL VARIABLES

3.7.1.1. RESTING PULSE RATE

Purpose

The purpose of this test is to measure the resting pulse rate at rest.

Equipment

Citizens make digital portable blood Pressure monitors.

Procedure

The pulse rate of all the subjects was recorded in a sitting position, in the evening between 4 and 5 p.m. Before taking pulse rate the subjects were asked to relax for about 30minutes.

Then the subjects were instructed to sit in a back supported chair and maintain in a slight incline position and placed their left hand on the table. Next, the researcher was collected Heart Rate or pulse rate by using a Digital Heart Rate measuring machine which was placed in the chest level on a table. In this way, the researcher has measured the heart rate of the subject.

Scoring

The resting pulse rate is indicated in the digital monitor.

3.7.1.2. MEAN ARTERIAL BLOOD PRESSURE

Objective

The purpose of the test was to measure the systolic and diastolic blood pressure.

Equipment

A dial type of sphygmomanometer and stethoscope a chart and a table were used for recording the blood pressure.

Administration

The blood pressure for all the subjects was checked in the morning. The subjects were given adequate time to relax in a chair in a comfortable position so that the normal pressure was restored. While taxing the blood pressure the subject's right arm was completely made bare to make certain that the clothes did not compress the blood vessels. The instrument was kept at the level of the heart on the table. The blood pressure measurement was taken with the subject in a sitting position the forearm being kept straight in a relaxed position on the table. The pressure cuff was wrapped around the arm evenly the lower edge being placed approximately one inch above the anticubical space. Care was taken that the stethoscope was not in contact with the cuff. The cuff was inflated until the artery was fully pressed so that no heartbeat could be learned.

When the heartbeat was not audible air was released by opening the air valve of the rubber tube and the systolic stroke the heart sent to spurt into the artery and at

the peak of the systolic stroke, the first heartbeat becomes audible at which instant the read in millimeter of measuring (mmHg) was recorded with the gradual release of air, the heartbeat become muffled and then disappeared. This indicated blood pressure at the diastolic stage and the reading was noted in mm Hg.

Like the same blood pressure was recorded after the Brisk Walking exercise was over.

Mean arterial pressure

Mean arterial pressure also measured by using the formula.

P mean = Diastolic pressure + 1/3 pulse pressure.

Pulse pressure is the difference between systolic pressure and diastolic pressure. (Mathew, 1988)

3.7.1.3. VO_2 MAX

To ascertain VO_2 Max of the subjects, Cooper's formulae were used, and accordingly Cooper's 12 Minutes run / Walk Test was administered

Purpose

To measure the VO_2 max (cardio respiratory endurance)

Equipment

Whistle, stopwatch, 400 meters track.

Description

Cooper's twelve-minute run/walk test was administered with the help of qualified testers. For this test, 400 meters track was prepared with marking at every tenth meter. The investigator and the testers served as the lap scorers. The subjects were asked to stand on the starting arc drawn at the finish line of the 400 meters track and they were given instructions to cover as much distance as possible by running/walking. They were instructed to continue the run / walk till the final whistle. The race was started with a whistle and at the end of the twelfth minute again the whistle was blown. The number of minutes left was announced to the subjects every minute. At the twelfth minute a long whistle was blown and the subjects stopped instantly and stood on that spot. The lap scorers must rush to the spot and take the reading in nearest tenth meter.

Scoring

The distance in meters covered in 12 minutes. The VO2 max in ml/min/kg was calculated based on the formulae suggested by Cooper (1960) was:

$$\mathrm{VO_2\ max} = \frac{d_{12} - 505}{45}$$

Where d_{12} is the distance (in meters) covered in 12 minutes.

3.7.2. HEMATOLOGICAL VARIABLES

3.7.2.1 HEMOGLOBIN

Purpose

To find out the total hemoglobin count.

Equipments

Syringe, Test tubes, Microscope

Method used

Cyana methoglobin method.

Procedure

Take clean and dry pencilin bottle to add 5ml of Hemoglobin solution, add 20 micro liter of fresh blood mix well, and wait for 5 minutes take the reading calorio meter for 540 nanometer (green filter).

Normal **:** 12.00 to 16.00 gms

3.7.2.2.RBC TEST

Purpose

To find out the total RBC counts.

Equipments

Syringe, Test tubes, Microscope

Procedure

Take the RBC micro pipette draw 0.5 ml of fresh blood and again draw 101 marking hayms fluid shake the pipette mix for bead wait for 5 minutes charge the counting chamber count the cells for centre square (25small square)

3.7.2.3.WBC TEST

Purpose

To find out the total WBC counts.

Equipments

Syringe, Test tubes, Microscope

Procedure

Total WBC cells are increased in the blood is called leukemia; there are different types of leukemia.

- Chronic myeloid leukemia
- Myeloid leukemia

Take clean and dry pencilin bottle add 0.38 ml of truks fluid, add 20 micro liter of fresh blood mix well take the counting chamber put the coverslip change one drop of solution. Count the cells for 10* (low power objective microscope) count four corner square * 50.

Example **:** 208 * 50.

Normal **:** 3.50 to 5.50 million cells/cumm

3.7.3.KIN ANTHROPOMETRIC VARIABLES

3.7.3.1. FAT MASS

Purpose:

To assess the subjects fat mass.

Procedure:

Subject's percentage of fat and body weight was measured by using Omron body fat monitor and weighing machine respectively. Fat-free mass was calculated by the following formula.

Scoring:

Fat mass (kg) = percentage fat X body weight (kg)

3.7.3.2. LEAN BODY MASS

Purpose:

To assess the subjects fat mass.

Procedure:

Subject's body weight was measured by using a weighing machine and fat mass was measured by using the formula fat mass (kg) = percentage fat X body weight (kg). Lean body mass was calculated by the following formula.

Scoring:

Lean Body Mass (kg) = body weight (kg) – Fat Mass (kg)

3.8. STATISTICAL TECHNIQUE

The data obtained were analyzed by Analysis of Covariance (ANCOVA) to assess the significant difference among the groups between the pre-test and post-test on physiological, hematological, and kin anthropometric variables to find out the effects of aerobic rhythmic exercise and weight training on selected physiological, hematological and kin anthropometric variables among college men obese students. The normality of the data collected was tested through F test (ANCOVA). The data and the regression were plotted and found to be in the standing straight line and thus tested for normality of data and found the data are normal. The adjusted post test mean differences among the experimental groups were tested and if the adjusted post test result was significant the Scheffe's post hoc test was used to determine the significance of the paired means differences.

The investigator has analyzed scientific results obtained by application of various methodologies discussed above and the results are analyzed and presented in form of detailed discussion graphs and various tables in the next chapter.

CHAPTER - IV

RESULTS AND DISCUSSIONS

4.1 OVERVIEW

This chapter deals with the analysis of data collected from the subjects under the study. The purpose of this study was to find out the effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students. The three groups namely an experimental group- I (Aerobic rhythmic exercises) , experimental group- II(Weight training) and group- III (Control group, No training was provided) were analyzed with the differences in the measures of selected physiological, hematological, and kin anthropometric variables in College men obese students to pre-test and post-test.

The subjects are selected at random but the groups were not equated in relation to factors to be examined. Hence the difference between the means at the three groups in the pre - test had to be taken into account during the analysis of the post - test difference between the means. This was achieved by the final means were adjusted for differences in the initial means and the adjusted means were tested for significance. When the post–test means were significant, the scheffe's hoc test was administered to find out the paired means significance difference.

4.2 TEST OF SIGNIFICANCE

They could the critical portion of the thesis in concluding by examining the hypothesis. This procedure of testing the hypothesis was done by accepting the research hypothesis or rejecting the same in accordance with the results in relation to the level of confidence fixed by 0.05 level of confidence.

4.3. LEVEL OF SIGNIFICANCE

The probability level below which the hypothesis is rejected is termed as the level of significance. The 'F' ratio obtained by analysis of covariance was compared at 0.05 level of significance. An analysis of covariance of 'F' ratio 3.22 is needed for significance at the 0.05 level of confidence for the degrees freedom 2 and 42.

4.4 COMPUTATION OF ANALYSIS OF COVARIANCE AND SCHEFFE'S POST HOC TEST.

The following tables illustrate the statistical result of the effects of aerobic rhythmic exercise and weight training onVo2 max, Resting Pulse Rate, Mean Arterial Pressure, Hemoglobin count, Red Blood Cells (RBC), White Blood Cells (WBC), Fat Mass, Lean Body Massamong college men obese students. The ordered adjusted means and differences between the means of the groups under study were given in the following tables.

4.5. RESULTS ON RESTING PULSE RATE

The physiological variable resting pulse rate was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on Resting pulse rate among college men obese students are presented in Table V.

TABLE-V

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF RESTING PULSE RATE OF EXPERIMENTAL AND CONTROL GROUP

(Scores in Beats Per Minute)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	73.867	74.400	74.533	Between	2	3.73333	1.86666	0.112
				Within	42	697.066	16.5968	
Post-test mean	71.400	70.333	74.467	Between	2	138.13	69.0666	4.541*
				Within	42	638.67	15.2063	
Adjusted mean	71.76	70.21	74.23	Between	2	122.799	61.3998	36.39*
				Within	41	69.1601	1.68683	
Mean Gain	2.467	4.067	0.066					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table V shows that the pre test mean scores of Resting Pulse Rate of Experimental group I Aerobic rhythmic exercise was 73.8. Experimental Group II Weight training was 74.40 and the control group was 74.53. The post-test means

showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and the mean values recorded were 71.40, 70.33, and 74.46 respectively.

The obtained F value on pre-test scores 0.112 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at an initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was a significant difference between the groups as the obtained F value at 4.541 was greater than the required F value of 3.23. This proved that the differences between the post-test mean the subjects were significant.

Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 36.39 was greater than the required F value of 3.23. This proved that there were significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the physiological variable Resting Pulse Rate.

Since significant improvement were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in table VI.

TABLE - VI

SCHEFFE'S POST-HOC TEST FOR RESTING PULSE RATE

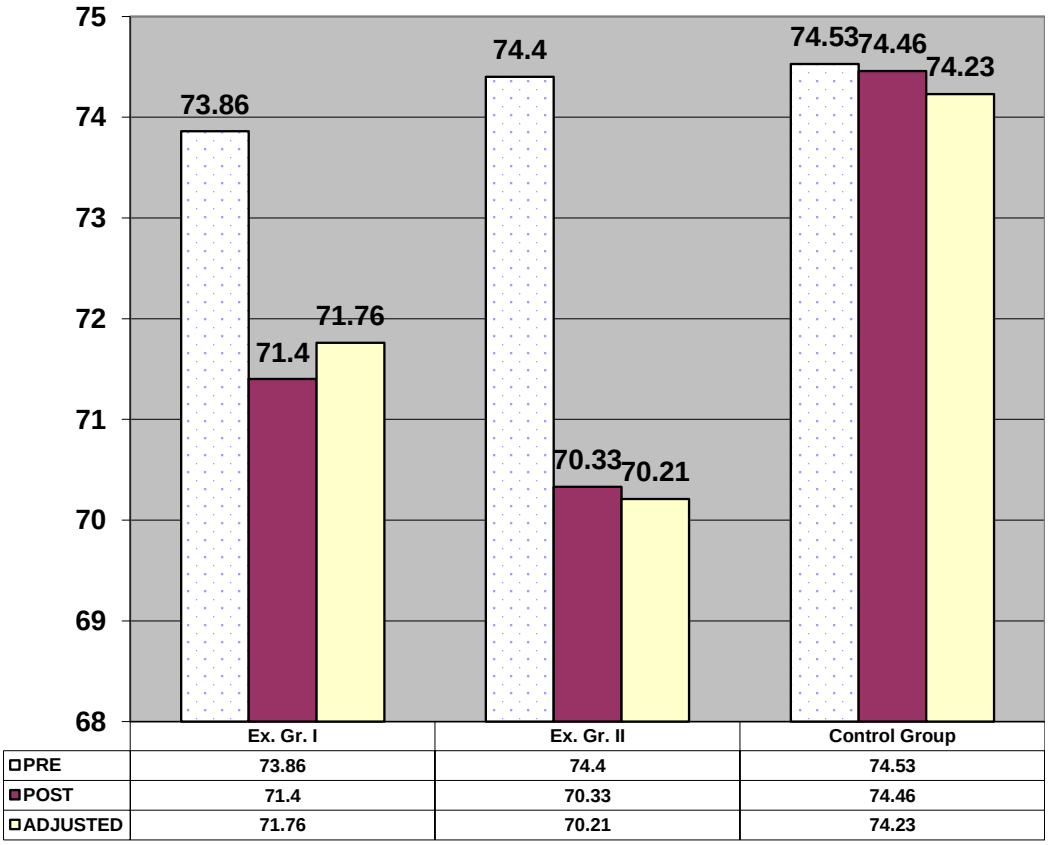
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean Difference	Required C.I
71.76	70.21		1.549*	1.37
71.76		74.23	2.4648*	
	70.21	74.23	4.013*	

Table-VI shows that there was a significant difference between the Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through the bar diagram in figure 1.

FIGURE - 1

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON RESTING PULSE RATE



	Ex. Gr. I	Ex. Gr. II	Control Group
PRE	73.86	74.4	74.53
POST	71.4	70.33	74.46
ADJUSTED	71.76	70.21	74.23

4.5.1. DISCUSSION ON FINDINGS OF RESTING PULSE RATE

The results presented in table V showed that the obtained adjusted means on Resting Pulse Rate among Aerobic rhythmic exercise group was 71.76 followed by Weight training group with the mean value of 70.21 and control group mean value of 74.23. The difference among pre-test scores Post-test scores and adjusted mean

scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.112, 4.541 and 36.39 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks of treatment in the Aerobic rhythmic exercise group and Weight training group there was a significant improvement (decrease) in Resting Pulse Rate than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely the Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Resting Pulse Rate has in line with the study conducted by **Stampfer MJ, et.al. (2000).**

4.6.RESULTS ON MEAN ARTERIAL PRESSURE

The physiological variable Mean Arterial Pressure was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on mean arterial pressure among college men obese students are presented in table VI.

TABLE-VI

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF MEAN ARTERIAL PRESSURE OF EXPERIMENTAL AND CONTROL GROUP

(Total Scores in mm/hg-P mean = Diastolic pressure + 1/3 pulse pressure.)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	99.067	98.533	98.200	Between	2	5.73333	2.8666	0.240
				Within	42	501.566	11.9420	
Post-test mean	93.633	94.400	98.067	Between	2	168.43	84.2166	4.206*
				Within	42	840.77	20.0182	
Adjusted mean	93.16	94.47	98.48	Between	2	228.263	114.131	14.82*
				Within	41	315.629	7.6982	
Mean Gain	5.43	4.13	0.133					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table VI shows that the pre-test mean scores of Mean Arterial Pressure of Experimental group I Aerobic rhythmic exercise was 99.06. Experimental Group II Weight training was 98.53 and the control group was 98.20. The post-test means showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and mean values recorded were 93.63, 94.40 and 98.20 respectively.

The obtained F value on pre test scores 0.240 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at initial stage and the randomization at the initial stage was equal.

The post test scores analysis proved that there was significant difference between the groups as the obtained F value at 4.206 was greater than the required F value of 3.23. This proved that the differences between the post test mean at the subjects were significant.

Taking into consideration the pre and post test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 14.825 was greater than the required F value of 3.23. This proved that there was Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the physiological variable Mean Arterial Pressure .

Since significant improvement were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in table VII.

TABLE - VII

SCHEFFE'S POST-HOC TEST FOR MEAN ARTERIAL PRESSURE

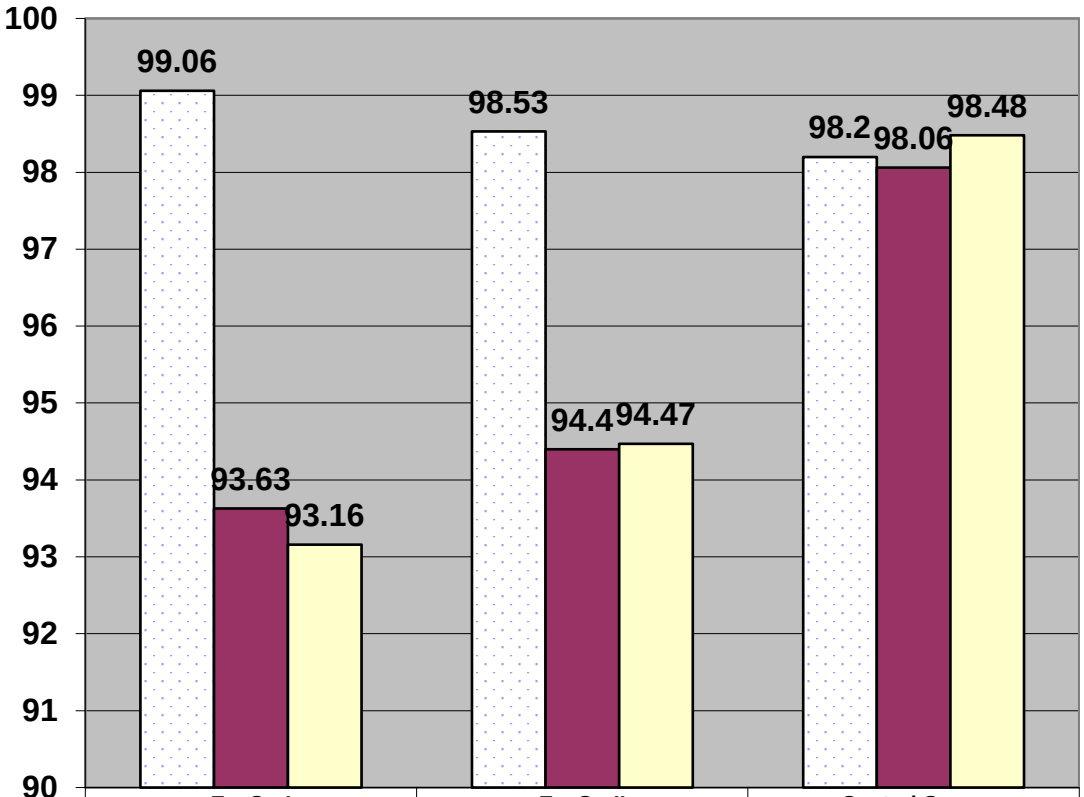
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean difference	Required C.I
93.16	94.47		1.312	2.93983
93.16		98.48	5.320	2.93982997
	94.47	98.48	4.008	2.93982997

Table-VII shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 2.

FIGURE - 2

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON MEAN ARTERIAL PRESSURE



	Ex. Gr. I	Ex. Gr. II	Control Group
PRE	99.06	98.53	98.2
POST	93.63	94.4	98.06
ADJUSTED	93.16	94.47	98.48

4.6.1. DISCUSSION ON FINDINGS OF MEAN ARTERIAL PRESSURE

The results presented in table VI showed that the obtained adjusted means on Mean Arterial Pressure among Aerobic rhythmic exercise group was 93.16 followed by Weight training group with the mean value of 94.47 and control group mean value of 98.48. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.240, 4.206 and 14.825 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks of treatment in Aerobic rhythmic exercise group and Weight training group there was significant improvement (decrease) in Mean Arterial Pressure than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Mean Arterial Pressure has in line with the study conducted by **Sclavo M. (2001).**

4.7. RESULTS ON VO2 MAX

The physiological variable Vo2 Max was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on Vo2 Max among college men obese students are presented in table VIII.

TABLE-VIII

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF VO2 MAX OF EXPERIMENTAL AND CONTROL GROUP

(Scores in no.s) $VO_2\ max = \frac{d_{12} - 505}{45}$

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	41.873	41.353	40.947	Between	2	6.47244	3.23622	0.1398
				Within	42	971.944	23.1415	
Post-test mean	45.820	44.447	41.160	Between	2	172.02	86.0095	5.4451*
				Within	42	663.42	15.7956	
Adjusted mean	45.49	44.47	41.46	Between	2	131.229	65.6148	12.164*
				Within	41	221.146	5.39382	
Mean Gain	3.947	3.094	0.213					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table VIII shows that the pre-test mean scores of Vo2 Max of Experimental group I Aerobic rhythmic exercise was 41.873. Experimental Group II Weight training was 41.353 and the control group was 40.947. The post-test means showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and the mean values recorded were 45.820, 44.447 and 41.160respectively.

The obtained F value on pre-test scores 0.139 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at an initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was a significant difference between the groups as the obtained F value at 5.44 was greater than the required F value of 3.23. This proved that the differences between the post test mean at the subjects were significant.

Taking into consideration the pre and post-test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 12.16 was greater than the required F value of 3.23. This proved that there were Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the physiological variable Vo2 Max

Since significant improvement were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in Table IX.

TABLE - IX

SCHEFFE'S POST-HOC TEST FOR VO2 MAX

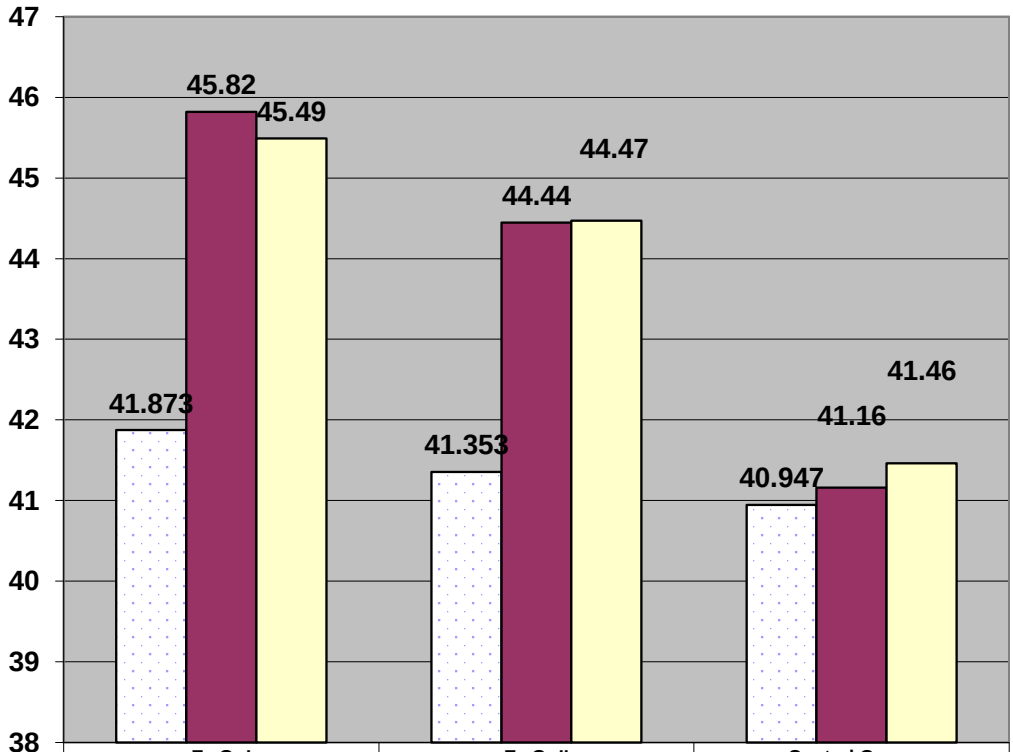
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group– II (Weight training)	Control Group	Mean difference	Required C.I
45.49	44.47		1.023	2.460
45.49		41.46	4.0358*	
	44.47	41.46	3.0128*	

Table - IX shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 3.

FIGURE - 3

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON VO2 MAX



	Ex.Gr.I	Ex.Gr.II	Control Group
PRE	41.873	41.353	40.947
POST	45.82	44.447	41.16
ADJUSTED	45.49	44.47	41.46

4.7.1. DISCUSSION ON FINDINGS OF VO2 MAX

The results presented in table VIII showed that the obtained adjusted means on Vo2 Max among Aerobic rhythmic exercise group was 45.49 followed by Weight training group with a mean value of 44.47 and control group mean value of 41.46. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.139, 5.44, and 12.16 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks treatment the Aerobic rhythmic exercise group and Weight training group there was significant improvement (decrease) in Vo2 Max than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Vo2 Max has in line with the study conducted by **Balabins (2001).**

4.8. RESULTS ON HEMOGLOBIN COUNT

The physiological variable Hemoglobin Count was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on Hemoglobin Count among college men obese students are presented in Table X.

TABLE-X

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF HEMOGLOBIN COUNT OF EXPERIMENTAL AND CONTROL GROUP

(Scores in per deciliter (g/dl)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	10.220	9.820	10.227	Between	2	1.62711	0.81355	1.164
				Within	42	29.3373	0.69850	
Post-test mean	13.613	12.893	10.413	Between	2	84.58	42.2909	63.640*
				Within	42	27.91	0.66453	
Adjusted mean	13.56	13.01	10.35	Between	2	87.4357	43.7178	79.606*
				Within	41	22.5160	0.54917	
Mean Gain	3.393	3.073	0.186					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table X shows that the pre-test means scores of Hemoglobin Count of Experimental group I Aerobic rhythmic exercise was 10.220. Experimental Group II Weight training was 9.820 and control group was 10.227. The post-test means

showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and mean values recorded were 13.613, 12.893 and 10.413 respectively.

The obtained F value on pre-test scores 1.1647 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at the t initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was a significant difference between the groups as the obtained F value at 63.640 was greater than the required F value of 3.23. This proved that the differences between the post-test mean of the subjects were significant.

Taking into consideration the pre and post-test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 79.606 was greater than the required F value of 3.23. This proved that there were Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the physiological variable Hemoglobin Count.

Since significant improvement were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in Table XI.

TABLE - XI

SCHEFFE'S POST-HOC TEST FOR HEMOGLOBIN COUNT

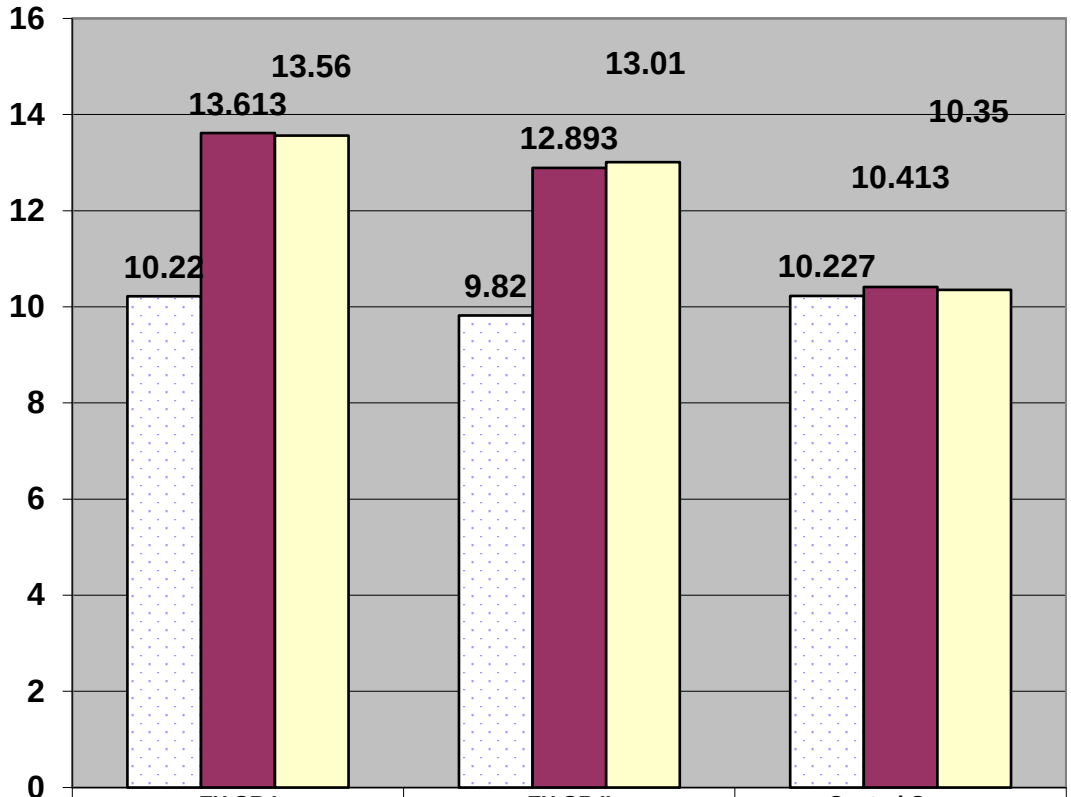
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean difference	Required C.I
13.56	13.01		0.548*	0.4851
13.56		10.35	3.204*	
	13.01	10.35	2.655*	

Table-XI shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 4.

FIGURE - 4

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON HEMOGLOBIN COUNT



	EX.GR.I	EX.GR.II	Control Group
PRE	10.22	9.82	10.227
POST	13.613	12.893	10.413
ADJUSTED	13.56	13.01	10.35

4.8.1. DISCUSSION ON FINDINGS OF HEMOGLOBIN COUNT

The results presented in table X showed that the obtained adjusted means on Hemoglobin Count among Aerobic rhythmic exercise group was 13.56 followed by Weight training group with the mean value of 13.01 and control group mean value of 10.35. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 1.1647, 63.640, and 79.606 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks treatment the Aerobic rhythmic exercise group and Weight training group there was significant improvement (decrease) in Hemoglobin Count than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Hemoglobin Count has in line with the study conducted by **Doggre ll SA. (2002).**

4.9. RESULTS ON RED BLOOD CELLS (RBC)

The physiological variable Red Blood Cells (RBC) was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on Red Blood Cells (RBC) among college men obese students are presented in Table XII.

TABLE-XII

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF RED BLOOD CELLS (RBC) OF EXPERIMENTAL AND CONTROL GROUP

(Scores in per cubic millimeter)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	4.883	4.672	4.638	Between	2	0.53003	0.26501	0.851
				Within	42	13.0780	0.31138	
Post-test mean	5.976	5.537	4.823	Between	2	10.15	5.07624	13.97*
				Within	42	15.25	0.36319	
Adjusted mean	5.96	5.54	4.84	Between	2	9.33836	4.66918	12.75*
				Within	41	15.0054	0.36598	
Mean Gain	1.093	0.865	0.185					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table XII shows that the pre-test mean scores of Red Blood Cells (RBC) of Experimental group I Aerobic rhythmic exercise was 4.883. Experimental Group II

Weight training was 4.672 and control group was 4.638. The post test means showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and mean values recorded were 5.97, 5.53, and 4.823 respectively.

The obtained F value on pretest scores 0.8510 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at an initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was a significant difference between the groups as the obtained F value at 13.976 was greater than the required F value of 3.23. This proved that the differences between the post-test mean at the subjects were significant.

Taking into consideration the pre and post-test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 12.75 was greater than the required F value of 3.23. This proved that there were Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the physiological variable Red Blood Cells (RBC) .

Since significant improvements were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in Table XIII.

TABLE - XIII

SCHEFFE'S POST-HOC TEST FOR RED BLOOD CELLS (RBC)

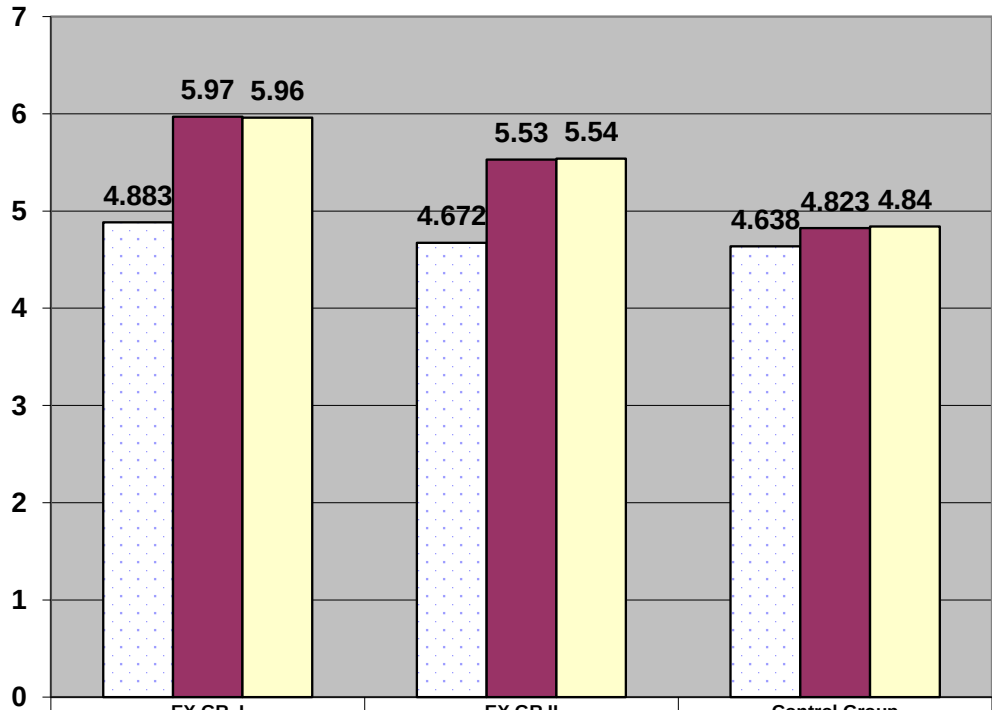
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean difference	Required C.I
5.96	5.54		0.410*	0.4040002
5.96		4.84	1.119*	
	5.54	4.84	0.709*	

Table-XIII shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 5.

FIGURE - 5

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON RED BLOOD CELLS (RBC)



	EX.GR. I	EX.GR.II	Control Group
PRE	4.883	4.672	4.638
POST	5.97	5.53	4.823
ADJUSTED	5.96	5.54	4.84

4.9.1. DISCUSSION ON FINDINGS OF RED BLOOD CELLS (RBC)

The results presented in table XII showed that the obtained adjusted means on Red Blood Cells (RBC) among Aerobic rhythmic exercise group was 5.96 followed by Weight training group with the mean value of 5.54 and control group mean value of 4.84. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.8510, 13.976, and 12.75 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks treatment the Aerobic rhythmic exercise group and Weight training group there was significant improvement (decrease) in Red Blood Cells (RBC) than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Red Blood Cells (RBC) has in line with the study conducted by **Praet et.al. (2008).**

4.10. RESULTS ON WHITE BLOOD CELLS (WBC)

The physiological variable White Blood Cells (WBC) was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on White Blood Cells (WBC) among college men obese students are presented in Table XIV.

TABLE - XIV

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF WHITE BLOOD CELLS (WBC) OF EXPERIMENTAL AND CONTROL GROUP

(Scores in per microliter)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	5.244	5.193	5.257	Between	2	0.03420	1.75556	0.626
				Within	42	0.46398	2.8	
Post-test mean	6.491	6.285	5.228	Between	2	13.77	1180.82	101.87*
				Within	42	1.23	11.5905	
Adjusted mean	6.49	6.28	5.23	Between	2	13.3991	1162.2	98.484*
				Within	41	1.22287	11.8009	
Mean Gain	1.247	1.092	0.029					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table XIV shows that the pre-test mean scores of White Blood Cells (WBC) of Experimental group I Aerobic rhythmic exercise was 5.244. Experimental Group II Weight training was 5.193 and control group was 5.257. The post-test means showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and mean values recorded were 6.491, 6.285, and 5.228 respectively.

The obtained F value on pre-test scores 0.626 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at an initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was a significant difference between the groups as the obtained F value at 101.87 was greater than the required F value of 3.23. This proved that the differences between the post-test mean of the subjects were significant.

Taking into consideration the pre and post-test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 98.484 was greater than the required F value of 3.23. This proved that there were Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the physiological variable White Blood Cells (WBC).

Since significant improvements were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in Table XV.

TABLE - XV

SCHEFFE'S POST-HOC TEST FOR WHITE BLOOD CELLS (WBC)

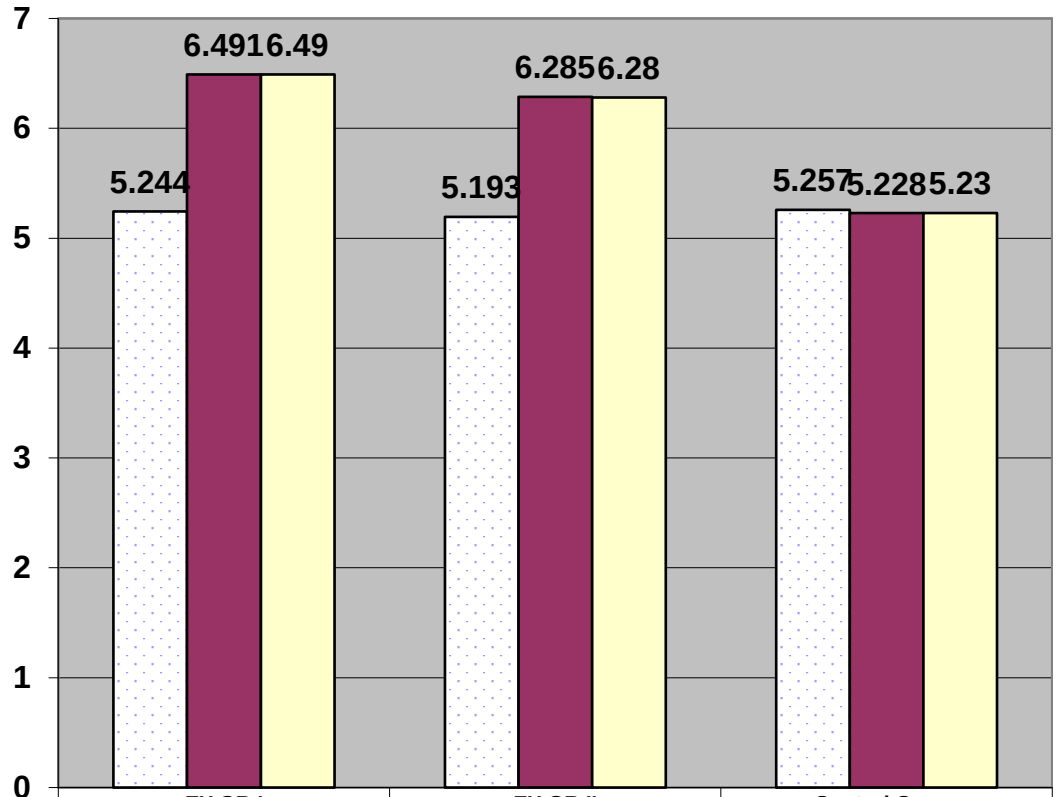
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean difference	Required C.I
6.49	6.28		0.213*	0.18298869
6.49		5.23	1.261*	
	6.28	5.23	1.048*	

Table-XV shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 6.

FIGURE - 6

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON WHITE BLOOD CELLS (WBC)



	EX.GR.I	EX.GR.II	Control Group
PRE	5.244	5.193	5.257
POST	6.491	6.285	5.228
ADJUSTED	6.49	6.28	5.23

4.10.1. DISCUSSION ON FINDINGS OF WHITE BLOOD CELLS (WBC)

The results presented in table XIV showed that the obtained adjusted means on White Blood Cells (WBC) among Aerobic rhythmic exercise group was 6.49 followed by Weight training group with the mean value of 6.28 and control group mean value of 5.23. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.626, 101.87, and 98.484 respectively. It was found that obtained F value on pretes-t score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks of treatment Aerobic rhythmic exercise group and Weight training group there was significant improvement (decrease) in White Blood Cells (WBC) than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on White Blood Cells (WBC) has in line with the study conducted by **Michael T.Smith, (2005).**

4.11. RESULTS ON FAT MASS

The Kin anthropometric Variable Fat Mass was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on Fat Mass among college men obese students is presented in Table XVI.

TABLE-XVI

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF FAT MASS OF EXPERIMENTAL AND CONTROL GROUP

(scores in = percentage fat X body weight (kg)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	30.671	29.182	30.814	Between	2	24.5004	12.2502	2.27
				Within	42	226.152	5.38459	
Post-test mean	25.969	27.337	31.163	Between	2	217.44	108.718	88.49*
				Within	42	51.60	1.22848	
Adjusted mean	26.01	27.23	31.22	Between	2	219.651	109.826	91.223*
				Within	41	49.3605	1.20391	
Mean Gain	4.711	1.812	0.349					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table XVI shows that the pre-test mean scores of Fat Mass of Experimental group I Aerobic rhythmic exercise was 30.671. Experimental Group II Weight training was 29.182 and control group was 30.814. The post-test means showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and mean values recorded were 25.96, 27.33, and 31.16 respectively.

The obtained F value on pre-test scores 2.275 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at an initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was a significant difference between the groups as the obtained F value at 88.49 was greater than the required F value of 3.23. This proved that the differences between the post-test mean of the subjects were significant.

Taking into consideration the pre and post-test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 91.22 was greater than the required F value of 3.23. This proved that there were Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the Kin anthropometric Variable Fat Mass.

Since significant improvement were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in Table XVII.

TABLE - XVII

SCHEFFE'S POST-HOC TEST FOR FAT MASS

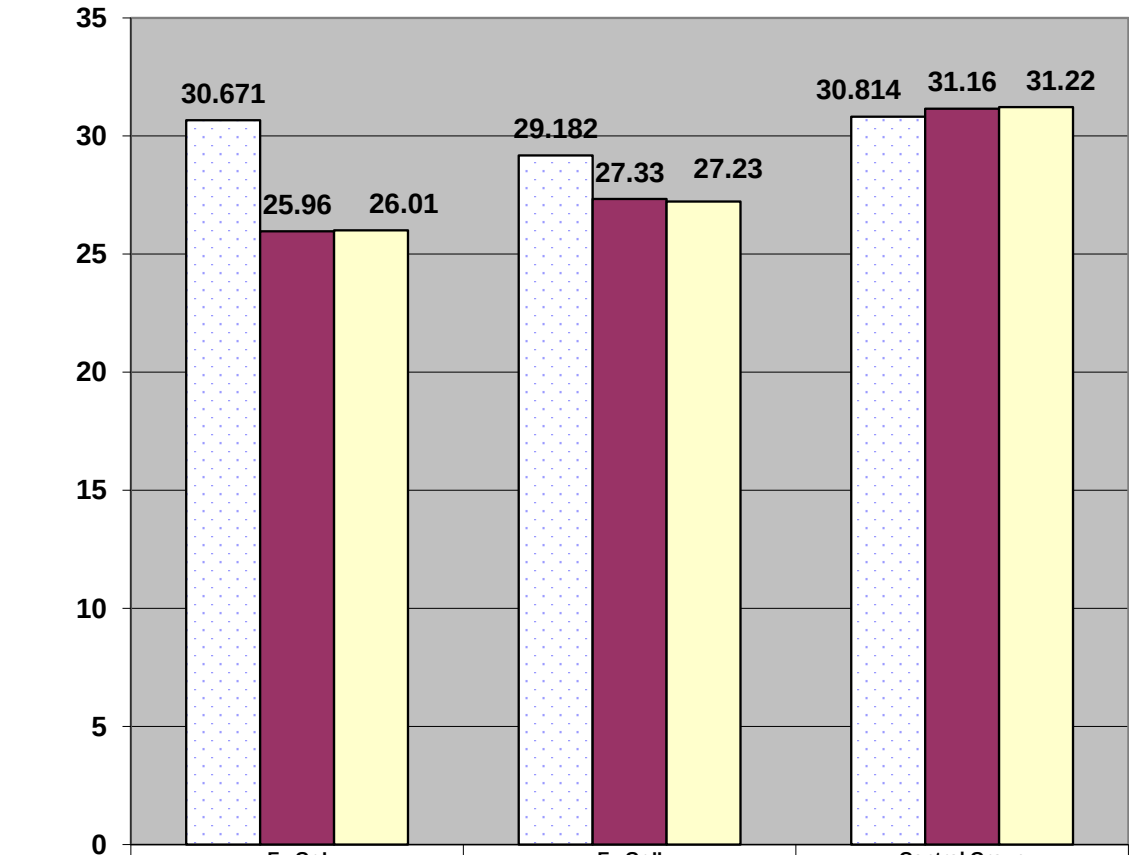
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean difference	Required C.I
26.01	27.23		1.220*	1.162
26.01		31.22	5.20*	
	27.23	31.22	3.98*	

Table-XVII shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 7.

FIGURE - 7

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON FAT MASS



	Ex.Gr.I	Ex.Gr.II	Control Group
PRE	30.671	29.182	30.814
POST	25.96	27.33	31.16
ADJUSTED	26.01	27.23	31.22

4.11.1. DISCUSSION ON FINDINGS OF FAT MASS

The results presented in table XVI showed that the obtained adjusted means on Fat Mass among Aerobic rhythmic exercise group was 26.01 followed by Weight training group with the mean value of 27.23 and control group mean value of 31.22. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 2.275, 88.49, and 91.22 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks treatment the Aerobic rhythmic exercise group and Weight training group there was a significant improvement (decrease) in Fat Mass than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Fat Mass has in line with the study conducted by **Yeater (1999).**

4.12. RESULTS ON LEAN BODY MASS

The Kin anthropometric Variable Lean Body Mass was measured through use instrument over Citizens make digital portable blood Pressure monitor. The results on the effects of aerobic rhythmic exercise and weight training on Lean Body Mass among college men obese students are presented in Table XVIII.

TABLE- XVIII

COMPUTATION OF MEAN AND ANALYSIS OF COVARIANCE OF LEAN BODY MASS OF EXPERIMENTAL AND CONTROL GROUP

(Scores in body weight (kg) – Fat Mass (kg)

Test	Experimental Group – I (aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control group	Source of variance	df	Sum of square	Mean square	F
Pre-test mean	48.800	49.067	49.133	Between	2	0.93333	0.46666	0.0848
				Within	42	231.066	5.50158	
Post-test mean	57.600	54.867	47.333	Between	2	848.13	424.066	87.88*
				Within	42	202.67	4.82539	
Adjusted mean	57.62	54.86	47.32	Between	2	850.476	425.238	87.03*
				Within	41	200.323	4.88594	
Mean Gain	8.8	5.8	1.8					

* F(0.05) (2,42 and 2, 41) = 3.23. *Significant at 0.05 level of confidence.

Table XVIII shows that the pre-test mean scores of Lean Body Mass of Experimental group I Aerobic rhythmic exercise was 48.80. Experimental Group II Weight training was 49.06 and control group was 49.13. The post-test means showed differences due to Twelve weeks of Aerobic rhythmic exercise &Weight training and mean values recorded were 57.60, 54.86, and 47.33 respectively.

The obtained F value on pre-test scores 0.084 was lesser than the required F value of 3.23 to be significant at 0.05 level. This proved that there was no significant difference between the groups at an initial stage and the randomization at the initial stage was equal.

The post-test scores analysis proved that there was significant difference between the groups as the obtained F value at 87.88 was greater than the required F value of 3.23. This proved that the differences between the post-test mean of the subjects were significant.

Taking into consideration the pre and post-test scores among the groups, adjusted mean scores were calculated and subjected to statistical treatment. The obtained F value at 87.03 was greater than the required F value of 3.23. This proved that there were Significant differences among the means due to Twelve weeks of Aerobic rhythmic exercise &Weight training on the Kin anthropometric Variable Lean Body Mass.

Since significant improvements were recorded. The results were subjected to post hoc analysis using Scheffe`s Confidence Interval test. The results were presented in Table XIX.

TABLE - XIX

SCHEFFE'S POST-HOC TEST FOR LEAN BODY MASS

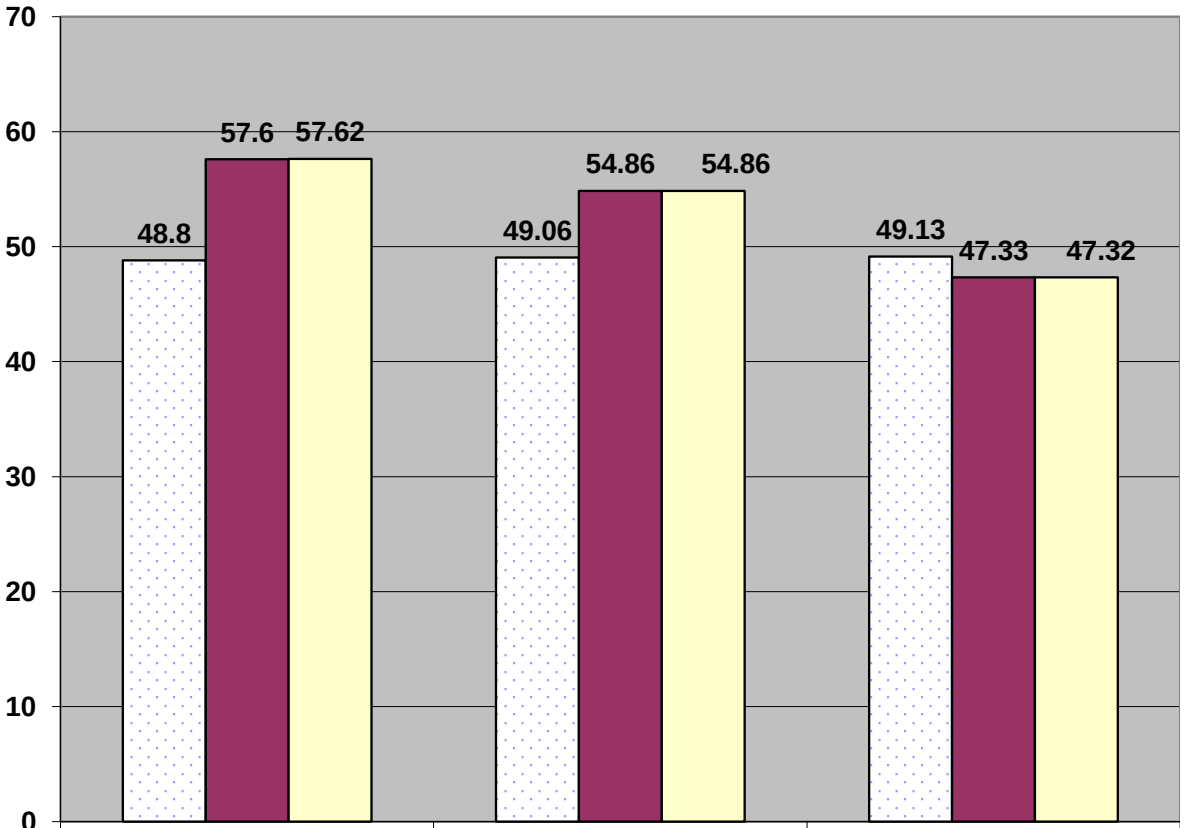
Experimental Group – I (Aerobic rhythmic exercise)	Experimental Group – II (Weight training)	Control Group	Mean difference	Required C.I
57.62	54.86		2.760*	2.34206993
57.62		47.32	10.300*	
	54.86	47.32	7.540*	

Table - XIX shows that there was a significant difference between Aerobic rhythmic exercise and control group and Weight training group and control group and Aerobic rhythmic exercise and Weight training group.

The obtained adjusted mean values were presented through bar diagram in figure 8.

FIGURE - 8

BAR DIAGRAM SHOWING PRE, POST AND ADJUSTED POST-TEST VALUES OF CONTROL GROUP, TWO EXPERIMENTAL GROUPS ON LEAN BODY MASS



	Ex.Gr.I	Ex.Gr.II	Control Group
PRE	48.8	49.06	49.13
POST	57.6	54.86	47.33
ADJUSTED	57.62	54.86	47.32

4.12.1. DISCUSSION ON FINDINGS OF LEAN BODY MASS

The results presented in table XVIII showed that the obtained adjusted means on Lean Body Mass among Aerobic rhythmic exercise group was 57.62 followed by Weight training group with the mean value of 54.86 and control group mean value of 47.32. The difference among pre-test scores Post-test scores and adjusted mean scores of the subjects were statistically treated using ANCOVA and F values obtained were 0.084, 87.88, and 87.03 respectively. It was found that obtained F value on pre-test score was not significant at 0.05 level of confidence as the obtained value was lesser than the required table value and post-test Scores was significant at 0.05 level of confidence as the value was greater than the required table F value of 3.23.

The post hoc analysis through Scheffe`s confidence test proved that due to Twelve weeks treatment the Aerobic rhythmic exercise group and Weight training group there was significant improvement (decrease) in Lean Body Mass than the control group and the differences were significant at 0.05 level. The post hoc analysis between the experimental group namely Aerobic rhythmic exercise group and Weight training proved that there was a significant difference.

The result of this study on Lean Body Mass has in line with the study conducted by **Jankowski(1999).**

4.13 DISCUSSION ON HYPOTHESES

Thus the researcher has successfully completed the study and presented the results clearly and proceeded with the summary and conclusions along with recommendations in the next chapter.

The formulated first hypotheses results is presented in tables V to XIX proved that there would be a significant improvement of Aerobic rhythmic exercise group on selected physiological, hematological and kin anthropometric variables such as (Vo2 max, Resting Pulse Rate, Mean Arterial Pressure, Hemoglobin count, Red Blood Cells (RBC), White Blood Cells (WBC), Fat Mass, Lean Body Mass) than the control group among college men obese students. Hence the first research hypothesis was accepted and (null hypothesis was rejected).

The formulated second hypotheses results are presented in tables V to XIX proved that there would be a significant improvement of Weight training group on selected physiological, hematological and kin anthropometric variables such as (Vo2 max, Resting Pulse Rate, Mean arterial Pressure, Hemoglobin count, Red Blood Cells (RBC), White Blood Cells (WBC), Fat Mass, Lean Body Mass) than the control group among college men obese students. Hence the second research hypothesis was accepted and (null hypothesis was rejected).

The formulated third hypothesis results are presented in tables V to XIX proved that there would be a significant difference between of Aerobic rhythmic exercise group and Weight training group on selected Physical, Physiological, and psychological variables such as (Flexibility, Systolic blood pressure, Body mass

index, Resting Pulse Rate, stress, anxiety and self confidence) among Men with andropause. Hence the third (research hypothesis) was accepted and (null hypothesis was rejected).

Hence the discussion on hypothesized has accepted at 0.05 level of confidence.

Thus the researcher has successfully completed the study and presented the results clearly and proceeded with the summary and conclusions along with recommendations in the next chapter.

CHAPTER - V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 SUMMARY

The purpose of the study was to find out the effects of aerobic rhythmic exercise and weight training on selected physiological, hematological, and kin anthropometric variables among college men obese students. Physiological, hematological, and kin anthropometric variables were dependent variables and a. Aerobic rhythmic exercise b. Weight training was taken as independent variables.

To facilitate this study (45) forty-five college men obese students from Dr..M.G.R University, Maduravoyal at Chennai were randomly selected as subjects. They were divided into three groups. Which were as follows:

a. **Experimental Group – I** - Aerobic rhythmic exercise

b. **Experimental Group - II** – Weight training

c. **Group 'C'** - (Control group, No training was provided).

The significance of the difference between the experimental groups I, II, and Group - III were found out by the pre-test and post-test. They were determined through analysis of covariance (ANCOVA). The adjusted post-test means were also computed by scheff's post hoc test. Thus the following results were obtained after the statistical analysis.

5.2 CONCLUSIONS

Within the limitation and delimitations set for the present study and considering the results obtained, the following conclusion was drawn.

Within the above-mentioned scope of this study, the following conclusions are arrived as:

Both Experimental Group I and Group II (aerobic rhythmic exercise and weight training) showed significant improvement in the physiological, hematological, and kin anthropometric variables such as (Vo2 max, Resting Pulse Rate, Mean Arterial Pressure, Hemoglobin count, Red Blood Cells (RBC), White Blood Cells (WBC), Fat Mass, Lean Body Mass) among college men obese students. These results are observed to be better than the control group among college men obese students.

Between Experimental Group I and Group II (aerobic rhythmic exercise and weight training), Experimental Group I (aerobic rhythmic exercise) is a group that had a demonstrate better results on all the physiological, hematological, and kin anthropometric variables such as (Vo2 max, Resting Pulse Rate, Mean Arterial Pressure, Hemoglobin count, Red Blood Cells (RBC), White Blood Cells (WBC), Fat Mass, Lean Body Mass) than Experimental Group II (weight training) among college men obese students.

5.3 RECOMMENTATIONS FOR PRACTITIONERS/ GOVERNMENT

The following recommendations have been derived based on the study for practitioners.

1. It was found that Aerobic rhythmic exercise should be useful for college women obese students.
2. It was found the Weight training also should be useful for college women obese students.
3. It was found that the combination of both also Aerobic rhythmic exercise is more suitable than the Weight training for the college women obese students.
4. Aerobic rhythmic exercise and Weight training may be recommended for men and women for all other diseases for better treatment.
5. Aerobic rhythmic exercise and Weight training may be recommended for management as well as coping the fat mass and lean body mass.
6. Aerobic rhythmic exercise and weight training may be recommended for the improvement of the men and women for general health.
7. Aerobic rhythmic exercise and Weight training may be included as a part of all health centers and all schools for the benefits of health and overall development.
8. Men and Women may be encouraged aerobic rhythmic exercise for their children.

9. Aerobic rhythmic exercise and weight training may be included in the academic curriculum.

10. The Government may encourage aerobic rhythmic exercise by introducing various schemes on fitness for the betterment of society.

5.4. SUGGESTION FOR FURTHER RESEARCH

1. Similar study can be undertaken on other age groups of Aerobic rhythmic exercise &Weight training.

2. Similar study can be undertaken for college women obese students also.

3. Similar study can be undertaken for hypertensive, stressed and diabetic college men and women students also.

4. Similar study can be undertaken for rural and urban obese college students.

5. Similar study can be done for other ailments also.

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APPENDIX A

RAW SCORES ON RESTING PULSE RATE

(Scores in Beats per minute)

RESTING PULSE RATE						
	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBICRHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
Sl. No	PRE TEST	POST TEST	PRE TEST	POST TEST	PRE TEST	POST TEST
1	72	71	75	73	76	71
2	73	72	78	75	77	72
3	71	72	69	68	75	73
4	70	71	75	75	68	66
5	75	75	80	78	76	72
6	76	75	75	70	81	75
7	74	75	79	78	71	66
8	73	75	70	67	79	76
9	78	78	68	65	73	70
10	81	80	71	70	69	65
11	79	78	75	70	68	65
12	77	78	68	66	76	70
13	75	75	80	78	76	72
14	76	75	75	70	81	75
15	68	67	70	68	70	67

APPENDIX B

RAW SCORES ON MEAN ARTERIAL BLOOD PRESSURE

(Total Scores in mm/hg-P mean = Diastolic pressure + 1/3 pulse pressure)

	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
SL. NO	PRE TEST	POST TEST	PRE TEST	POST TEST	PRE TEST	POST TEST
1	102	103.5	98.5	92	100	97.5
2	104.5	104	102	91	98	95.5
3	87.5	90	96	94	94	84
4	91	92.5	102.5	96	99.5	98.5
5	101.5	98.5	98	94	100	98.5
6	100.5	96	97.5	94	99	98.5
7	95	93	105	99	100.5	95
8	98.5	100	98	93.5	100	99
9	101.5	101	98	93	94	85
10	93	90	100	95	97.5	94
11	101.5	102	98	95.5	101	96
12	99	102.5	94	84	99	98.5
13	101.5	103	99.5	95.5	97.5	93.5
14	100	97	100	94.5	102.5	96
15	96	98	99	93.5	95.5	86.5

APPENDIX C

RAW SCORES ON VO2 MAX

(Scores in no.s) $\mathrm{VO_2\ max} = \frac{d_{12} - 505}{45}$

	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
SL. NO	PRE TEST	POST TEST	PRE TEST	POST TEST	PRE TEST	POST TEST
1	37.7	38.3	38.6	48.3	37.7	45.7
2	39.4	40.3	43.2	45	39.4	43.7
3	40.3	41	40.8	48.1	40.3	41.4
4	36.6	35.4	39.4	40.6	36.6	40.1
5	42.6	42.1	37.7	44.1	42.6	43.7
6	38.3	39.9	39.4	46.3	38.3	39.4
7	47	46.6	40.3	46.6	47	48.1
8	41	42.1	36.6	39.2	41	43
9	53	51	42.6	44.1	53	54.1
10	39.9	41	38.3	45.9	39.9	41
11	35.7	36.8	47	51	50.3	51.4
12	40.1	42.1	41	45	43	44.1
13	36.8	37.7	53	53.2	34.1	44.3
14	44.8	42.1	39.9	42.1	39.4	47.9
15	41	41	50.3	47.8	37.7	38.8

APPENDIX D

RAW SCORES ON RBC

(Scores in per deciliter (g/dl)

	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
SL. NO	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**
1	4.07	4.21	4.07	6	4.11	5.52
2	5.4	4.29	5.4	5.9	4.35	4.7
3	5.3	4.24	5.3	6.3	4.65	5
4	4.42	4.17	4.42	5.8	4.44	4.3
5	5.2	5.19	5.2	6.2	4.89	5.87
6	5.4	5.5	5.4	6.3	4.29	4.64
7	4.2	5.4	5.6	5.6	4.54	5.76
8	4.32	4.13	4.32	6.2	4.17	4.52
9	4.11	4.12	4.11	6.12	5.19	5.54
10	4.31	5.4	5.5	5.4	5.5	6
11	5.4	4.9	5.4	6.32	5.4	6.2
12	4.11	5.7	4.11	5.8	4.13	6.1
13	4.12	6.2	4.12	5.8	4.12	6.5
14	4.31	4.4	5.4	5.93	5.4	6.6
15	4.9	4.5	4.9	5.97	4.9	5.8

APPENDIX E

RAW SCORES ON WBC

(Scores in per micro liter)

	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
SL. NO	PRE TEST	POST TEST	PRE TEST	POST TEST	PRE TEST	POST TEST
1	5.28	5.22	5.12	6.48	5.28	6.54
2	5.19	5.38	5.2	6.22	5.19	6.28
3	5.22	5.15	5.12	6.77	5.22	6.32
4	5.23	5.34	5.32	6.56	5.1	6.11
5	5.3	5.43	5.41	6.58	5.17	6.22
6	5.2	5.11	5.4	6.49	5.16	6.39
7	5.21	5.33	5.21	6.28	5.08	6.19
8	5.21	5.35	5.1	6.62	5.25	5.9
9	5.12	5.02	5.17	6.98	5.29	6.33
10	5.21	5.42	5.16	6.11	5.17	6.44
11	5.12	5.12	5.08	6.54	5.16	6.29
12	5.2	5.21	5.25	6.45	5.08	6.31
13	5.47	5.12	5.29	6.37	5.25	6.29
14	5.43	5.2	5.42	6.54	5.29	6.24
15	5.47	5.02	5.41	6.37	5.21	6.42

APPENDIX F

RAW SCORES ON HEAMOGLOBIN

(Scores in per deciliter (g/dl)

	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
SL. NO	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**
1	8.8	8.4	10.3	13.9	9.8	12.5
2	8.6	9.1	10.7	14.4	9.9	11.4
3	9.2	9.7	8.9	14.3	9.6	11.2
4	8	9.3	9.6	13.5	10.8	12.9
5	9.5	9.5	10.3	13.3	9.3	13.2
6	10.3	10.8	11.3	13.6	9.5	12.4
7	11.9	11.2	10.3	14.2	9.9	13.5
8	11.4	11.3	11.4	14	9.7	13.2
9	10.9	10.8	10.2	13.7	9.8	12.6
10	10.7	10.7	10.4	12.5	9.8	12.8
11	10.5	11.09	9.8	12.6	10.7	13.2
12	11.2	11.2	9.6	12.8	10.5	13.2
13	10.9	11.6	10.7	12.9	9.7	13.9
14	11.3	10.6	10.6	13.9	9.4	13.5
15	10.2	10.9	9.2	14.6	8.9	13.9

APPENDIX G

RAW SCORES ON FAT MASS

(scores in = percentage fat X body weight (kg)

	CONTROL GROUP		EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)		EXPERIMENTAL GROUP – II (WEIGHT TRAINING)	
SL. NO	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**
1	31.85	30.51	30.59	26.12	29.54	27.35
2	30.47	31.44	29.62	26.75	25.45	26.34
3	29.33	30.99	30.77	26.61	30.12	26.88
4	27.32	31.47	27.68	25.22	26.09	28.33
5	33.56	30.11	32.09	25.36	33.65	27.28
6	29.84	35.31	28.99	26.44	25.12	26.11
7	32.96	30.22	31.16	27.11	26.98	27.63
8	30.33	31.85	30.44	25.08	30.23	28.98
9	30.91	30.77	31.18	27.07	29.87	26.39
10	35.45	28.36	34.72	25.36	25.36	27.28
11	26.37	31.63	29.51	24.86	29.74	27.63
12	29.01	31.85	29.34	25.13	29.65	27.21
13	31.08	30.89	31.28	25.98	32.87	26.89
14	32.95	31.85	32.12	25.72	32.85	26.39
15	30.78	30.19	30.57	26.72	30.21	29.36

APPENDIX H

RAW SCORES ON LEAN BODY MASS

(Scores in body weight (kg) – Fat Mass (kg))

	CONTROL GROUP		**EXPERIMENTAL GROUP – I (AEROBIC RHYTHMIC EXERCISE)**		**EXPERIMENTAL GROUP – II (WEIGHT TRAINING)**	
SL. NO	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**	**PRE TEST**	**POST TEST**
1	45	44	45	60	47	53
2	52	51	49	59	47	53
3	52	50	52	59	49	53
4	47	47	51	54	48	54
5	51	47	48	59	51	54
6	53	45	46	55	51	55
7	46	49	46	55	48	55
8	51	45	51	59	51	54
9	47	53	51	60	50	53
10	46	46	51	60	46	55
11	49	46	50	58	48	58
12	50	47	50	56	50	56
13	47	45	47	59	47	59
14	51	49	45	56	53	56
15	50	46	50	55	50	55

EFFECTS OF AEROBIC RHYTHMIC EXERCISE AND WEIGHT TRAINING ON SELECTED PHYSIOLOGICAL HAEMATOLOGICAL AND KINANTHROPOMETRIC VARIABLES AMONG COLLEGE MEN OBESE STUDENTS

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